March 1963

culture

SELECTED CONTENTS

Silent Spring . . . . *A Review by* . *Dr. Ieuan Thomas*

Tranquillity in the Hen House . . . . . *Harry Glasser*

Considering Sheep . . . . . *T. J. C. David*

Paraquat—A New Herbicide . . *J. O. Green and Lewis Jones*

Rearing Pullets on Oats . . . . . *W. M. R. Evans*

Cows on a Card Index . . . . . *G. P. Chitty*

Carrion Crows in Northern England . . . . *Denis Burgess*

Should Lambs be Shorn? . . . . . *L. Bailey Jones*

Bringing Back the Acres: Opencast Coal . . *W. Morley Davies*

Published for the Ministry of Agriculture, Fisheries and Food by Her Majesty's Stationery Office

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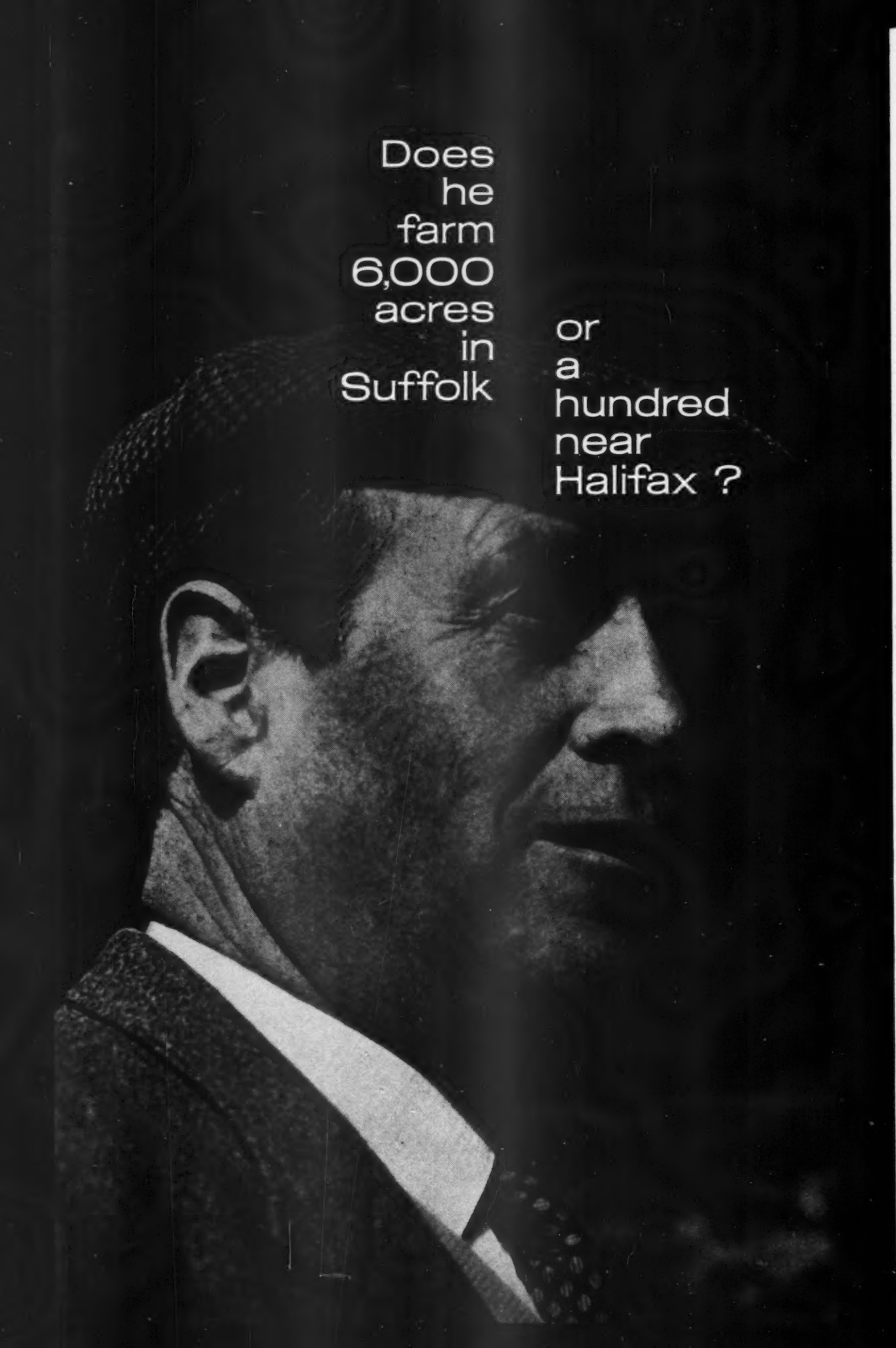
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Agriculture

VOLUME 70 · NUMBER 3 · MARCH 1963

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Whitehall Place, London S.W.1. Trafalgar 7711

CONTENTS

The Bedded Area 101
Silent Spring—A Review by *Dr. Ieuan Thomas* 102
Tranquillity in the Hen House *Harry Glasser* 106
Considering Sheep *T. J. C. David* 110
Paraquat—A New Herbicide *J. O. Green* and *Lewis Jones* . . 115
Rearing Pullets on Oats *W. M. R. Evans* 119
Cows on a Card Index *G. P. Chitty* 122
Carrion Crows in Northern England *Denis Burgess* . . . 126
Should Lambs be Shorn? *L. Bailey Jones* 130
Ministry's Publications 132
Bringing Back the Acres—Opencast Coal *W. Morley Davies* . . 133
Farming Cameo Series 3: 2. Mid-Bedfordshire *A. Brown* . . 139
Your Fixed Equipment: Building Layout and Labour *L. M. Parsons* . 141
Agricultural Chemicals Approval Scheme 143
In Brief 144
Book Reviews 147

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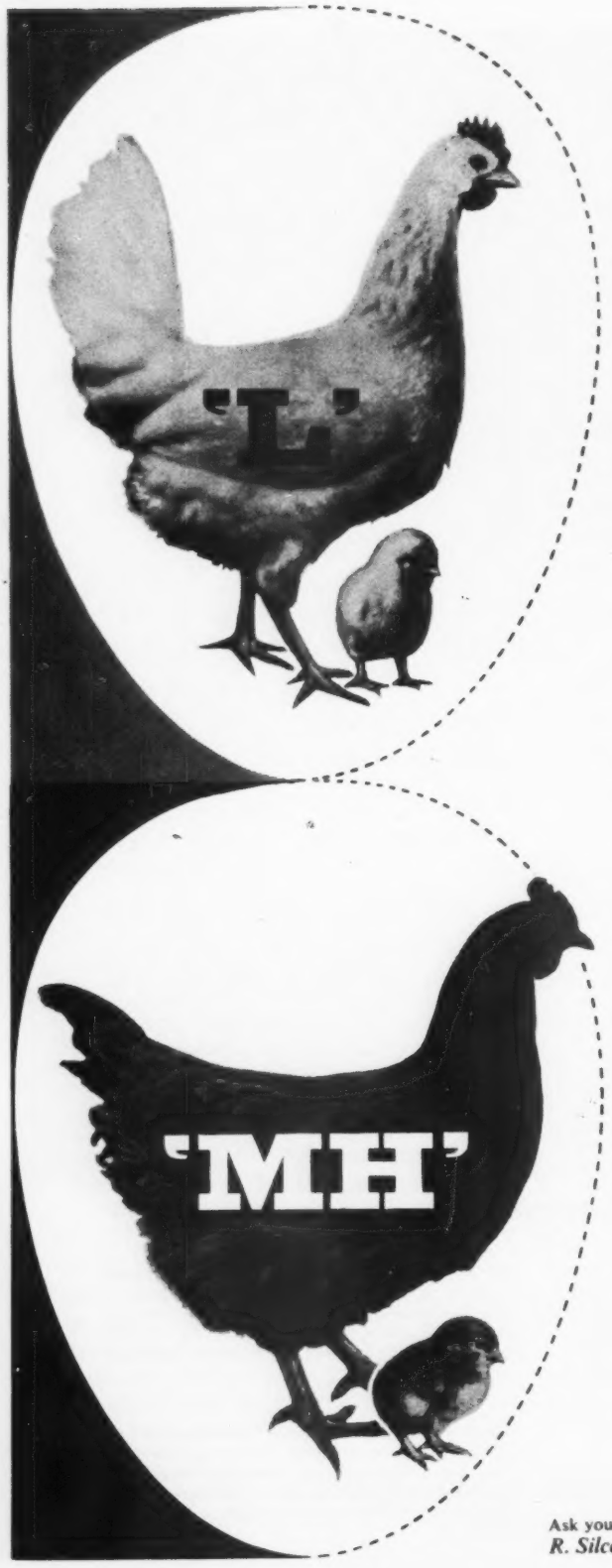

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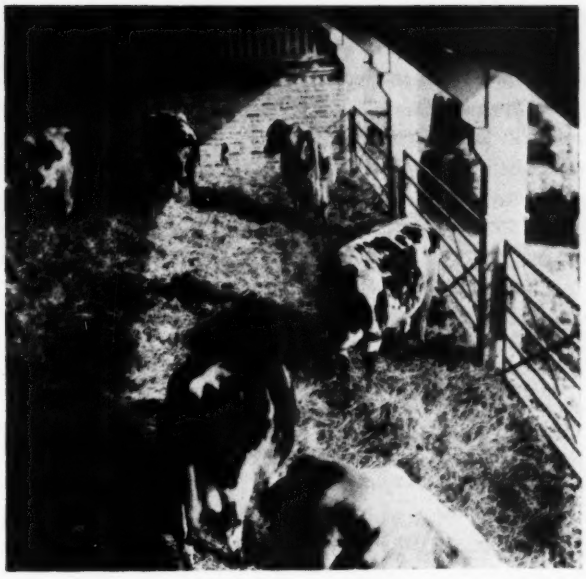


The Bedded Area

THERE are still some farmers who bed down the whole of the area in their cow yards, but this is now the exception rather than the rule. Modern practice is to have a concreted area for feeding and a littered area for resting, hence the term 'bedded area'.

No hard and fast figures can be laid down as to the area required; it may vary from 30 sq. ft to 50 sq. ft per cow, according to breed, shape of yard or type of management. More important than the size of bed and type of litter is the need for strict routine management to keep it in a condition in which cows will not become grossly soiled.

In most districts it is essential to economize in the use of bedding, and the following five points should help to achieve this.

Don't feed or water on the bed. Put down a deep bed, such as a layer of bales, before the yard is used. Clean the feeding area and litter the bed daily. Restrict its use by control between it and the concrete feeding area. Avoid tightly enclosed buildings and provide adequate ventilation in addition to that provided at the ridge.

Dr. Ieuan Thomas

Director of the Ministry's Infestation Control Laboratory, reviews the United Kingdom edition of Miss Rachel Carson's controversial book, "Silent Spring". It has just been published by Hamish Hamilton at 25s.

Miss Rachel Carson

Silent Spring

When he contemplated the many diseases and potential accidents threatening him, he was astounded that he had managed to stay in good health as long as he had.

Joseph Heller

ELIXIRS of Death, Needless Havoc, And No Birds Sing, Rivers of Death, Indiscriminately from the Skies, Beyond the Dreams of the Borgias—these are some of the chapter headings of *Silent Spring*, a book by the biologist Rachel Carson, calculated to chill the marrow of her readers.

The first chapter describes a town in the heart of America where 'Some evil spell had settled on the community: mysterious maladies swept the flocks of chickens; the cattle and sheep sickened and died. Everywhere was a shadow of death'. Yet at the end of the chapter Miss Carson says that this town does not really exist. This is only one of the literary devices Miss Carson uses in a book in which she describes 'the reckless and irresponsible poisoning of the world that man shares with other creatures'. The main thesis is that 'we are adding a new chapter and a new kind of havoc—the direct killing of birds, mammals, fishes, and indeed practically every form of wildlife by chemical insecticides indiscriminately sprayed on the land'.

There is no doubt about the authenticity of the incidents described, for the end of the book carries fifty pages of references, mostly to scientific papers. But Miss Carson has set out deliberately to emphasize all possible dangers from toxic chemicals and, in order to focus attention on the problem, has, in the manner of an advocate, omitted equally important references and

quotations that put the other point of view. So far as the United Kingdom is concerned, there are too some misinterpretations.

Take for instance the deaths of birds and other animals due to the use of toxic seed dressings that occurred in this country from 1956 to 1961. Miss Carson begins by stating that the change from fungicidal dressings to dual-purpose dressings (insecticide and fungicide) took place in 1956, whereas in fact it took place when BHC was first used as a seed dressing eight or nine years earlier. Deaths of seed-eating birds started to occur with the introduction of aldrin, dieldrin and heptachlor dressings, and this is what the author might have meant. The investigation made by the Estimates Committee is described as if that Committee had been specially set up to look into this problem. This was not so. In reading of the deaths of foxes that occurred between November, 1959, and April, 1960, one is left with the inference that 1,300 foxes died from eating poisoned mice or birds, whereas it is known that an encephalitic virus disease was diagnosed in some of these animals, and this may have been one of the factors partially responsible for so many deaths. Miss Carson says 'England, plagued by rabbits, sorely needs the fox as a predator', whereas the rabbit population is controlled by myxomatosis and by the efforts of Rabbit Clearance Societies. Foxes are hunted and shot to keep their numbers in check—indeed, foxes are not 'sorely needed'.

Chemical residues

The problems arising from the accumulation of residues of chlorinated hydrocarbon insecticides are part of the main thesis of this book, and attention is drawn in particular to the dangers of the build-up of residues in soil and how such insecticides may enter food chains through the soil fauna. The possibility that this occurs has been recognized in this country and in the U.S.A. Nevertheless Miss Carson has done a real service in drawing more attention to these food chains and, though research in this field has recently been intensified, much more needs to be done. Most biologists here and abroad would probably endorse the author's indictment of the use of 'blanket sprays' over large areas of the countryside. This method is never practised in this country and never likely to be suggested by biologists or chemists, private or official.

From this point, however, the book goes on to describe the possible accumulation of residues in the human body, and the author claims that such residues can give rise to serious liver damage, hepatitis and child cancer. It is known that DDT does accumulate in fat, but recent experiments have indicated that at threshold levels dependent upon the rate of intake the chemical is excreted as rapidly as it is taken in. Though very large doses of DDT and related compounds can cause degeneration in liver cells, it is known that no liver damage is likely to result from exposure to DDT at the level used in commercial pest control work. Indeed there is no evidence which would suggest that in the United Kingdom there is any serious hazard to human health likely to result from the proper use of any pesticide material. Even if we look at the possibility of accidental death from the use of poisonous chemicals, the figures are reassuring: The Report on Safety, Health, Welfare and Wages in Agriculture to 30th September, 1961, shows that for the period 1957–61 deaths caused by tractors numbered 204; from accidental falls, 61; from gunshot, 22; from bulls, 14; and from poisons, 2.

Perhaps the least satisfactory part of this book is that which suggests that the increasing incidence of leukaemia is attributable to the wider use of pesticides—especially DDT. Miss Carson does not mention that the increased incidence of leukaemia ante-dates the use of DDT, nor does she mention that no case of leukaemia has ever been described among people working in DDT formulating plants, where they are heavily exposed to the chemical.

What of benefits to mankind?

Though the author admits that pesticides have their uses, she does not attempt to describe the great benefits to mankind that have resulted from their use throughout the years. Insecticides, fungicides and herbicides are some of the tools that have made it possible to increase the yield of crops to present-day levels, but they must be properly used. Their mis-use, through ignorance, deliberately or by accident, may lead to deaths of plants and animals and even of man. Industrialists, biologists, chemists, Government bodies and farmers know that this is so and, in this country at least, all have joined forces to see that the risks are reduced to an absolute minimum.

Silent Spring was originally written in America and it was written largely about America for Americans, but the net is cast very widely and Miss Carson, having chosen to describe in great detail incidents that have occurred in Britain, should surely have made some reference to the great care that has been taken to ensure that these chemicals are being used properly. No reference is made, for instance, to the Zuckerman Working Parties on Precautionary Measures against Toxic Chemicals used in Agriculture (1951), Residues in Food (1953) and Risks to Wild Life (1955). No reference is made to the Notification of Pesticides Scheme, which arose from the recommendation of these Working Parties and under which manufacturers have undertaken to notify all new chemicals and new uses of chemicals, and not to market toxic chemicals until they have been cleared and can, if properly used, be used with safety. The Agriculture (Poisonous Substances) Regulations linked with this scheme are working well, and the Sanders Research Study Group found no evidence that these British schemes were failing in their purpose or that more could be achieved by compulsory measures. Fortunately, Lord Shackleton in the foreword to the United Kingdom edition of *Silent Spring* has rectified some of these omissions and has pointed out that there is effective control to prevent the poisoning of agricultural workers and that the Government, through its scientific sub-committees, 'is doing a good deal more work in other parts of the field than it is generally given credit for'.

Biological methods

In the last chapter, 'The Other Road', Miss Carson points out that 'insects are beset not only by viruses and bacteria but also by fungi, protozoa, microscopic worms, and other beings from all that unseen world of minute life that, by and large, befriends mankind', and says 'Why should they not also aid us in the control of insects?'

Most applied entomologists will probably agree that biological methods of control have not always been fully exploited, but from a very large number of attempts to use the method comparatively few have been successful. Success is most likely when a pest has been introduced into a country without its natural enemies but 'big fleas have little fleas . . .' and it is very important

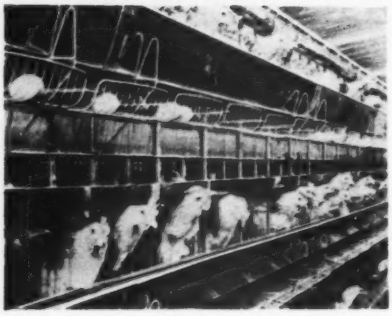
to see that no hyperparasites are introduced, also that the parasite itself will not parasitize a beneficial insect in its new home. Problems of host resistance might also arise, but this seems to be more likely in the biological control of vertebrates in which, not only does host resistance develop, but the disease organism itself may become less virulent. This has indeed happened to the myxoma virus which was introduced into Australia for the control of rabbits and which accidentally turned up in this country.

Again, a biological agent cannot be used to control a pest until there is a fair population of the host present; our standards of hygiene and control in the case of insects are today so high and the demands for high quality products so insistent, that such small populations cannot often be tolerated. Even *Bacillus thuringiensis*, which Miss Carson points out has been used commercially for the control of various pests, suffers from these disadvantages. It is known to exist in different strains, and the choice of a strain suitable for the control of a particular pest depends on a knowledge of the special attributes of the strain in relation to the specific susceptibility of the host. But biologists have known that the problems we face may be such that for a time we may have to accept a lower standard of control and that biological control has had and will have a very important part to play. Eventually, however, the time will come when chemists, biochemists and biologists will have evolved pesticides or other agents that are specific or nearly specific to particular pests. This is one of their aims, and it is not an impossibility.

An emotional book

The biologist who has worked in this field for many years is left with the feeling that had this book been written more objectively, it would have met a real need and would have narrowed rather than widened the gap between scientist and layman. There is a very real danger that the general public, knowing this book to be written by a biologist, will accept it as a genuine scientific version of this problem. This it certainly is not and was probably never intended to be. In a highly emotional and over-emphatic way *Silent Spring* will draw the attention of the public to acute problems that biologists and chemists have been striving, and with considerable success, to solve for two decades or more.

In high-lighting the very poisonous nature of the pesticides we use, a good job has been done; in drawing more attention to possible accumulation of poisonous residues in soil and in food chains, a good job has been done; in emphasizing the need for more research, a good job has been done. But if the publication of this book results in people being extremely worried about non-existent or remote dangers against many of which there are adequate safeguards; and if, as seems likely, hundreds of hours of scientists' time have to be spent in correcting the many false impressions given; and if, as seems possible, its publication results in decreased food production, then the eventual result will be more, rather than less, suffering, misery and death to the human race.



HARRY GLASSER

is an enthusiast of windowless housing for caged laying birds

Tranquillity in the Hen House

'WE'RE going to step up our egg production and we want to put up another battery house. Do you think we should make it windowless?' This is a question I am asked more frequently than any other. It is nearly five years since I first went over to windowless houses, so I suppose it is reasonable to assume that by this time I ought to be able to tell if windowless houses have come to stay.

With ever-increasing running costs, and more slender profit margins, nobody wants to invest hard-earned capital in a particular kind of house, just because it happens to be the vogue. Are there any snags?

No disadvantages

I have been trying hard to think of any disadvantages—some unexpected disappointments with windowless housing that the past five years may have shown up. I can't think of any. True, failures have been reported in the poultry press but I am persuaded that these have been due to those two time-honoured false economies which poultry farmers persist in practising—inadequate ventilation and insufficient insulation! There is more to windowless housing than just the absence of windows, and the job needs to be done properly to gain the full benefit which this type of housing offers over the conventional type. Here let me say briefly just what these advantages are.

Much has been written about the beneficial effect on egg size, shell quality and rate of maturity which results from controlled environment. These benefits, as well as an enhanced rate of production, are real enough; but if light patterns had never been heard of I should still want my windowless houses for a multiplicity of reasons which, when added together, amount to the elimination of stress and the consequential rise in the hen-house average. You don't have to spend long on a poultry farm before you discover how easily layers can be upset by the most trivial things. A cheeky sparrow flies against a window, a branch falls from a tree, a beam of sunlight catches a metal scoop. All these are disturbances when there are windows in the laying house, and they destroy the tranquillity which, my experience tells me, is absolutely essential for maximum egg yield.

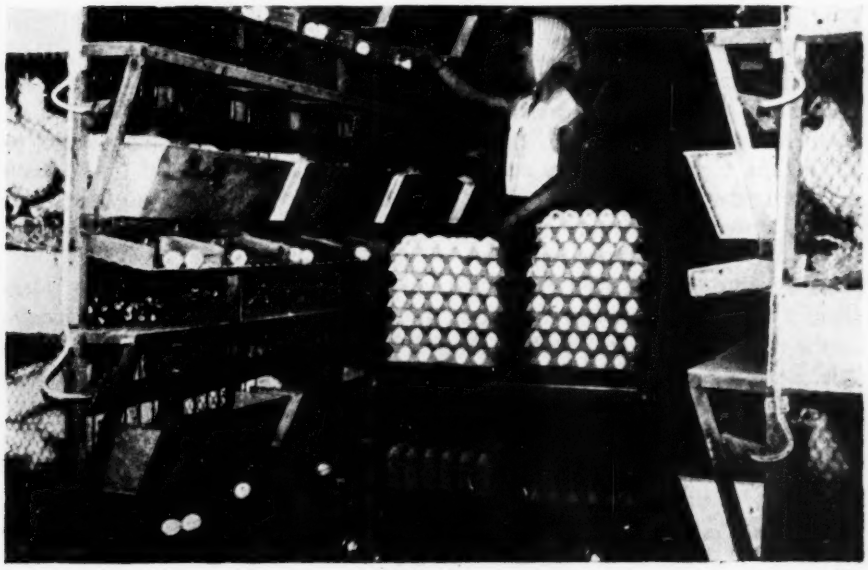
Proper ventilation

Success or failure in a windowless house will depend almost entirely on the efficiency of the ventilation. Back in 1958 I had the good fortune to be guided in my experimental work in this field by Dr. C. N. Davies. Nobody in this country had any experience of how to ventilate a battery house with no windows—only light-trapped air inlets and fan exhausts. Nobody knew the likely air extraction rates which poultry might need at the hottest time of the year, least of all the fan manufacturers.

Dr. Davies insisted on an extraction rate of 2 cu. ft of air per lb of bird per minute. At that time the popular estimated requirements seemed to be 1 cu. ft per lb of bird per minute—exactly half! Slowly but surely, opinion has veered towards the higher extraction rate and, having seen the poor results of under-ventilation, I have had good reason to bless my good fortune of getting the right advice at the very beginning.

There are critics who will tell you that such a high extraction rate is too costly. Is it so costly? Proper ventilation will amount to between five and

Clean eggs and dry droppings are a sure sign that all is well with ventilation



Exhaust cowls on roof, designed to minimize light entry and back draught

seven per cent of the total cost of the house. What do I get for my money? In a battery house measuring approximately 85 ft × 18 ft 6 in. I am able to house 2,400 layers. At the height of summer it feels noticeably cooler inside the house, due of course to the air movement created by the fans. The droppings are as dry as one would expect on free range, and they need to be removed only once a fortnight. Since there is no smelly atmosphere and no beams of sunlight shining on them, the eggs are under the best possible storage conditions from the very moment they are laid. With a stocking rate that nobody dreamed possible a couple of decades ago, with birds in an environment so fresh that it reduces the risk of respiratory disorders to the very minimum, and with the end product as cool and clean as one would wish for, is 2 cu. ft per lb of bird per minute such an unwarranted extravagance?

Thermostats can do the job unaided

It has been stated that it is unsatisfactory to attempt to control the air extraction rate with thermostats alone, relying solely on rise and fall of temperature. My own experience is to the contrary. The system works to perfection. Certainly, if you economize on your insulation and try to keep up the temperature in the house by minimizing the area of the air inlets and cutting down the extraction rate, then of course it doesn't work. You are guilty of ventilation brinkmanship.

In a well-designed, well-insulated, windowless battery house the air inlets should be so generous (three or four times the total area of the fan exhausts in the ridge) that in very cold weather it should be possible to keep the fans idle for long periods without the atmosphere becoming stuffy. You can rely solely on cross-ventilation from the light-trapped air inlets on one side to those on the other. If you cannot do this, then inlets and exhausts are inadequate and insulation may also be below the required standard. Moreover, generous air inlets combine with the fan exhausts to provide an invaluable emergency ventilation system in the event of a power failure, thus avoiding the need for a costly standby generating plant.

The best size of fan to use

The ideal unit around which to build a system of ventilation is the 24-in. fan which works at 700 r.p.m. The initial cost is rather higher than that for a smaller fan which works at a higher speed, but running costs with the larger, slower fan are much less since it consumes less current. Equally important—you won't upset your neighbours with the noise.

Avoid manual control

You will not be present to operate a switch when a hot day in summer gives way to a bitterly cold night. Instead, you will lie awake wondering what it's like in your battery house. Thermostats in conjunction with an auto-transformer speed regulator should be installed to reduce the extraction rate in several stages, down to about one-sixth, in order to cater automatically for all temperature variations. A few drops of titanic chloride at a given point on the floor of your windowless house will, when exposed to the atmosphere, produce a cloud of white vapour which will give you an excellent visible check on how the air is circulating.

In my own experience, a clockwork time-switch to regulate the light periods is preferable to an all-electric one which can play havoc with your lights if a power failure has taken place and nobody has remembered to adjust the time-switch. The clockwork kind needs to be wound at fortnightly intervals, a regular chore which forms part of a set routine. But this is a personal preference.

We have still a great deal to learn about light patterns, and the task of our research workers is not made easier by an apparent difference in reaction as between one strain of bird and another. Morriss and Fox and many others are doing invaluable experimental work to give us the information we need. This much is certain, however: windowless houses are here to stay.

Mr. Glasser, who farms near Tring, Hertfordshire, has been experimenting with light patterns and windowless houses ever since the first reports of Dale King's trials in 1958.

N.A.A.S. QUARTERLY REVIEW

Some of the articles in the Spring issue now on sale:

Problems of Toxic Elements in Crop Husbandry	J. W. Blood
Possibility of Chemical Control of Bracken	G. L. Hodgson
The Place of Farmer-groups in Advisory Work	H. Burr
Testing of the Charollais Breed in Britain	W. R. Smith
Fertilizers and Hypomagnesaemia	Karen M. Wolton

Considering Sheep

WHERE ARE WE GOING WITH OUR SHEEP?

In this third, and final, article arising from the Harrogate Livestock Breeding Conference, the short- and long-term objectives are examined by

T. J. C. DAVID

We must welcome the future, remembering that soon it will be the past; and we must respect the past, remembering that once it was all that was humanly possible. GEORGE SANTAYANA

THE profitability of sheep farming in this country shows a good deal of variation from farm to farm. The trend in costs continues upwards and falling prices are forecast. Efforts to combat these economic factors are being made, through greater specialization and intensification.

Amongst other important trends which seem likely to influence the development of the industry are: (1) a demand for standard graded lamb, with forward contracting for specific weights and grades, and a lessening of differences in regional requirements; (2) the probability of a clear-cut demand, for both light and heavy carcasses, each of suitable quality; (3) the demand for sheep that require little shepherding and yet whose performance is high; and (4) the group breeding of quality stock by producer co-operatives.

Answers wanted

There are many gaps in our knowledge of sheep husbandry. If breeders and commercial sheep folk are going to match successfully the more exacting demands of the future, then answers to some of the following fundamental problems are required urgently.

We want more information about management techniques in relation to flock size. Inter-breed experiments would shed light on the likely performance of respective breeds under specific conditions. We need more data about the productive longevity of different breeds under various management systems. We must list any special characteristics required of sheep that are to be grazed intensively. We need information on the efficiency of food conversion in relation to lambing percentage and stocking rates. Fuller husbandry and economic facts are required about systems of housing and yarding for ewes and lambs on both hill and lowland farms. The techniques of performance

and progeny testing need investigating as well as work on breeding methods, on a farm scale, for the improvement of weakly heritable characteristics. We must learn more about the influence of breeds and strains upon lamb survival at birth. The performance of cross-bred sheep needs investigating to show, for example, how much of their prolificacy is simply inherited and how much is due to hybrid vigour; also, we want to know if it is necessary or not to breed stock in the environment in which they are to be used.

We need some precise measure for carcass appraisal and fleece specifications, relevant to breeding objectives. Investigation into controlled reproduction, both chemical and otherwise, would be valuable, and a plea must be made for a continued vigorous approach to the problem of flock health.

Fat lamb production

The main purpose of sheep husbandry in this country is the production of fat lamb, most of which is produced on lowland farms. The general pattern involves the annual drafting from the mountains and uplands to the lowlands of commercial ewes of pure- or cross-bred type for further crossing with Down rams. The lowland crossing flock may be regarded as the central point in our sheep breeding, and the majority of flocks are engaged to some extent, directly or indirectly, in supplying breeding ewes and rams to sustain this.

This system of stratification has substantial genetic advantages. Besides, it is the best way of making use of our natural resources and secures a balance of animal and grass production unequalled anywhere else in Europe. It is hoped that the system will continue, but there is a danger that any sharp fall in sheep prices may aggravate the low returns from many hill farms and eventually affect the supply of primary breeds in the stratification process.

There are about forty recognized pure breeds of sheep in Britain. In terms of their function they can be grouped into six categories, four of which are directly involved in the stratification process.

Short-term objectives

If the sheep industry is to make progress, breeders must have clear and simple objectives, related to increased productivity.

Objectives can be considered as attainable in the short- or long-term; the short-term may be defined as ten years and the long-term over that.

In the short-term, breeders can do little more than identify the most productive strains within their flocks and begin their multiplication. The way in which each breed uses the next ten years will vitally affect its future.

Categories, classification of breeds according to their main function and suggested objectives, are given below.

HILL FLOCKS

Blackface, Black Welsh, Cheviot, Dales-bred, Dartmoor, Derbyshire Gritstone, Exmoor Horn, Herdwick, Hill Radnor, Lonk, North Country Cheviot, Rough Fell, Shetland, Swaledale, Welsh Mountain, White Face Dartmoor.

A 100 per cent lamb crop.

An average wool clip of 5 lb, with reduced variation in quality.

Ewe losses of less than 5 per cent.

Uniform growth of lambs through higher milk yield.

FLOCKS PRODUCING THE SIRES OF CROSS-BRED EWES

Blue-faced Leicester, Border Leicester, Colbred, Teeswater, Wensleydale.

Prolificacy of the cross-bred daughters should be around 200 per cent.

Milking ability on normal grass feeding should be sufficient for quick growth in a lamb crop of this size.

The sheep themselves should have demonstrably larger frames than the cross-bred ewes which ultimately they are expected to sire.

FLOCKS PRODUCING FAT LAMB SIRES

Dorset Down, Hampshire Down, Oxford Down, Ryeland, Shropshire, South Down, Suffolk, Wiltshire Horn.

To sire lambs to produce acceptable carcasses at less than 42 lb.

FLOCKS PRODUCING MUTTON SIRES

Cotswold, Lincoln Longwool, Leicester.

To sire acceptable 50-lb carcasses out of a wide variety of ewes.

SELF-CONTAINED FLOCKS PRODUCING THEIR OWN REPLACEMENTS, FEMALES FOR SALE AND FAT LAMBS

Beulah Speckled Face, Clun Forest, Devon Close Wool, Devon Long Wool, Kent, Kerry Hill, Llanwenog, North Country Cheviot, South Devon.

Two distinct targets are possible:

For breeds interested primarily in fat lamb production, 160–170 per cent lambs to 40 lb dead weight at 12–16 weeks, with a wool clip of 6–7 lb.

There is also a place for breeds of lower fertility, possibly 120–130 per cent, provided wool output is at least 10 lb.

LOWLAND FLOCKS BEING DEVELOPED FOR LAMBING OUT OF SEASON AND MORE FREQUENTLY THAN ONCE A YEAR

Dorset Horn, Polled Dorset Horn.

A lambing percentage of 150, with adequate milk to produce a 40 lb-carcass in 16 weeks.

Long-term objectives

Breeders thinking ahead must plan to meet the needs of buyers who will be more critical of their requirements than they are at present. These buyers are likely to want a continual supply in large numbers of sheep that will give a high uniform performance under precise and skilled management.

It is in regard to long-term objectives that breeders have the opportunity to make the greater contribution to the future of the industry.

Hill sheep

A higher turnover must be the aim for many hill holdings, particularly those that may be economically vulnerable. Intensification could come from modifications in grazing management or through an increase in winter housing and indoor lambing. This would require high lambing percentages with ewes being returned to the hills accompanied by whatever numbers of lambs they and the hill can manage; the rest being reared artificially.

Flocks might, therefore, concentrate on high prolificacy in a sheltered environment, whilst retaining characters of hardiness and the ability to forage during the summer.

This division of functions could take place within existing breeds, but might best be done by developing some breeds for intensive systems and some for extensive systems.

In addition, selecting hill sheep for higher prolificacy would, through stratification, influence the productivity of a large proportion of lowland fat lamb producing flocks.

Sires of cross-bred ewes

This is a vital category of sheep in the stratification process, and efforts should be made to develop specially designed breeds which, when mated with nominated hill breeds (or even strains within those breeds), would produce daughters of outstanding performance.

The ability to transmit high prolificacy is essential and the cross-bred daughters must milk well and over a longer lactation, to rear a considerable proportion of triplets without shepherding difficulties.

Flocks producing sires of cross-bred ewes should be developed in association with flocks producing draft hill ewes, so that strains of sheep suited particularly to crossing with other specified strains can be developed.

Under commercial conditions, it is likely that cross-bred ewe flocks will be kept increasingly where high output per ewe, e.g., 2–3 lambs apiece, is of primary importance.

Self-contained flocks

With advances in disease control and intensive methods aimed at high outputs per acre, increases will be seen in the number of specialist sheep enterprises using this category of sheep.

Nucleus flocks should concentrate on producing sheep suited to this kind of production, and breeders should set themselves targets which can be achieved within systems similar to the commercial conditions in which the sheep will ultimately be kept. Breeders may think of three or four lambs per ewe per year from a type of ewe which needs to produce little milk and which would respond to early weaning and preparation for a second lamp crop.

What can we do about it?

How are these objectives to be attained? In the first instance, Sheep Societies might define clearly the objectives for their breed and decide its place in the overall stratification pattern.

The next step might be to identify those flocks whose recorded performance conforms most closely to the defined objectives. These could be labelled 'nucleus flocks'.

Other ram-selling flocks might be classified as 'multipliers'. These flocks would have the opportunity of re-grading annually on the basis of performance, and they should conform to whatever standards of breed type that seem necessary.

Experimental flocks might be recognized. In these, sheep of other breeds could be introduced in an attempt to direct progress in the right direction.

All the categories have a high proportion of small flocks. Even among hill flocks, where the average size is 180, two-fifths have less than 50 ewes and, in breeds producing sires of cross-bred ewes, over half the flocks have less than

18 ewes. Small flocks have little scope for adequate comparison between ram progeny groups. About one-third of all flocks use only one ram a year, and almost as many use only two. Only in the 10 per cent of flocks using five rams or more is there much chance of an effective choice between rams, or any value in selecting sons of the best, for further breeding within the flock.

The problem of selecting rams for small flocks and the likely scarcity of central testing facilities may point towards future co-operative breeding schemes organized by Breed Societies. Groups of breeders with common objectives may be able to arrange for progeny testing and the exchange of rams amongst themselves. Joint recording schemes would also reduce the overhead costs of recording. While the individual breeder would retain ownership of his own flock, co-operation of this kind would offer the same benefits as if he ran a large flock and used central testing facilities.

Technical advice and the provision of some central register for suitable flock records are services that should be within the reach of the large Societies. The small ones might usefully provide such a service in collaboration with other Societies or by arrangement with the N.A.A.S.

Breeds whose main function is to combine with other breeds in the stratification of the industry, might consider much closer collaboration than is now common. There is evidence that some animals may transmit differently when crossed from that when bred pure. Crossing breeds might develop themselves for use with another specified breed if the best results are to be achieved.

Briefly

Decreasing profit margins and the development of intensive methods will sharpen the demand for sheep that must perform well under precise management.

The use of a register of flock management details, including ewe records, would provide all concerned with a picture of the level of flock performance. It will also indicate the potential improvements that may be expected through better management.

Progeny testing, or some other form of family selection based on individual ewe records, is essential in any flock hoping to make an impact in the future.

In each breed there are people of skill and resources, able to produce sheep of immense importance in the years ahead. And geneticists and advisers are always ready to help with advice in setting objectives and seeking their attainment.

The author, **T. J. C. David, N.D.D.**, is a Livestock Husbandry Officer in the N.A.A.S., stationed in Essex. For some time he was Technical Secretary of the Morris Committee on Sheep Recording and Progeny Testing, and he was the convenor of the Sheep Panel at last November's National Livestock Breeding Conference, to which this article relates.

Paraquat is a quick-acting, non-residual herbicide, particularly toxic to grasses but showing some favourable selective action among them at moderate dosage. It also checks a number of broad-leaved weeds, but clovers and lucerne recover quickly from spraying. Paraquat shows promise for the renovation of leys and, in conjunction with the minimum of cultivation, for the reseeding of old pasture

PARAQUAT

A NEW HERBICIDE

J. O. Green • Lewis Jones

THE impact of weed-killers on our grassland to date has been disappointingly small. Could this be because we have mistakenly regarded certain broad-leaved plants—buttercups, thistles, docks and the 'flat-weeds'—as the important weeds? Spectacular control of such plants can be brought about with hormone-type herbicides but, after all, many of them infest our grasslands only because the soil is in a low state of fertility: their removal does little to promote the growth of grass.

When deficiencies of lime, phosphates and potash are corrected, and when sufficient nitrogen is available for vigorous growth of grasses (be it from clover or nitrogenous fertilizer), the grasses become so competitive that many of the broad-leaved weeds are quickly suppressed. They may still interfere with the utilization of the grass, but a small dose of MCPA will then eliminate them.

However, a good crop of grass is not necessarily a crop of good grasses. Unpalatable and unproductive grasses persist in old pasture, despite improvements in manuring and in grazing control. Almost any sown pasture will sooner or later be invaded by rough-stalked meadow grass, creeping bent or other weed grasses.

The real weed problem in grassland is the control of these less desirable grass species. Because of their botanical similarity they are almost certainly the most serious competitors of the useful grasses. For the same simple reason thay have so far proved the most difficult to control selectively by chemical treatment. And because they are either less palatable or less accessible to the grazing animal they are very difficult to keep under control by pasture management.

It is this difficulty of shaking off unwanted grasses that has led farmers, interested in higher output from grassland, to take the extreme action of ploughing and reseeding, and to repeat the process whenever weed grasses appear to be regaining their stranglehold.

The grass on the right was sprayed with paraquat at the recommended rate. That on the left was not treated

When TCA, dalapon and aminotriazole were added to the chemical armoury in the mid-'fifties, it became technically possible to destroy grasses, as well as broad-leaved plants, without ploughing. For the all-grass farmer, and especially for those on land which does not lend itself to ploughing, a new vista was opened up. There is now a considerable amount of experience in the use of these three chemicals for killing grass in preparation for oversowing. All of them remain toxic in the soil for some time after spraying, and one of the snags frequently encountered is that, by the time it is safe to oversow, some remnants of the old turf have begun to regenerate, or seeds buried in the surface soil are germinating. The oversown seeds are therefore up against competition from the outset.

Paraquat for reseeding old turf

Paraquat*, a new herbicide which is particularly toxic to grasses and very rapid in action, has an apparent advantage in this respect, because once it comes into contact with the soil it loses its toxicity. Thus seeds may be sown immediately or very soon after spraying and, if conditions are suitable for germination and rooting, the seedlings will establish themselves before the old sward makes any recovery.

The dose of paraquat at present recommended for total kill of grasses in lowland pasture is 1 lb active ingredient, with an appropriate wetting agent, applied in not less than 20 gal water per acre. Up to 2 lb a.i. has been found necessary on some matted hill swards. The chemical is quickly absorbed and its effectiveness is not likely to be much impaired by rain after spraying. Its action, which takes place only in the light, is to destroy the vital green pigment, chlorophyll. Under bright conditions the effect may be so rapid that movement of the chemical in the plant, which is important for a full kill, is restricted. Spraying under dull conditions or late in the day is therefore recommended. There should not be too much herbage at the time of spraying, but enough to give good interception of the spray.

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*Paraquat is available under the proprietary name 'Gramoxone'.

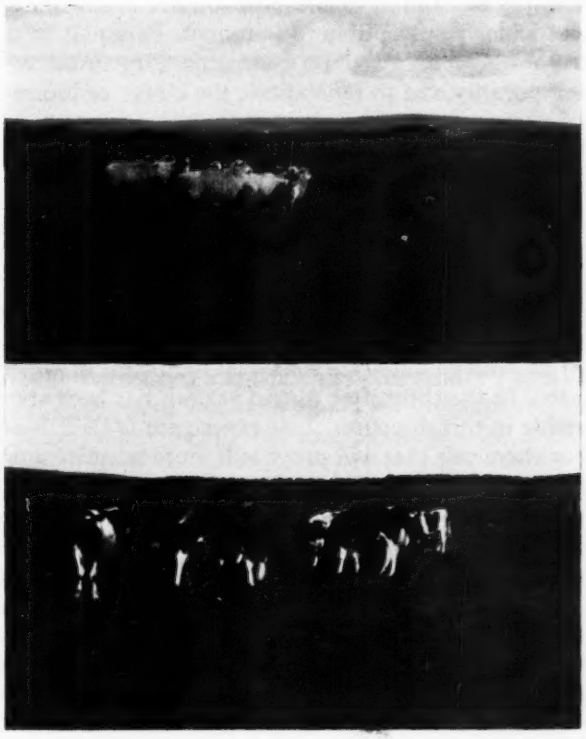
Provided the spraying is carried out with due care, paraquat can be relied upon to give a good knock-down of grasses and some broad-leaved plants too. (If there are many of the latter, some pre-treatment with MCPA or 2,4-D may be necessary.) For good results from the oversowing of a treated sward, however, there is this further important proviso: that the seed should make contact with the soil.

Field experiments carried out with paraquat since 1960 have shown that whereas in some circumstances seeds broadcast on the surface without any cultivation will produce a good new sward, there are other circumstances where they will fail. The failures tend to occur where the original turf has a dense mat of undecomposed stubble and roots. Even if the seeds germinate they may still fail to establish a root-hold. In these situations some cultivation appears to be necessary, in order to bring the seeds into contact with the soil.

Now, while paraquat is very rapidly absorbed, it may take two or three weeks to permeate the whole plant and kill it. For the chemical to have its full effect, the old herbage should not be disturbed during this time, so that cultivation and, therefore oversowing, must be delayed. Nevertheless a sod seeder can be used immediately after spraying: good penetration of the turf and good depth control are needed, but the machine need not expose any soil if paraquat is used.

Selectivity of paraquat

While paraquat was singled out for its toxicity to grasses in general, it is lethal to some grasses at doses from which others will recover. There is an indication from experiments carried out so far that cocksfoot and perennial



Before treatment this pasture consisted of unproductive grasses and was as shown in the top picture. Paraquat, applied in August, killed the old grass, which was then burned and the surface harrowed.
Seeds were sown broadcast in September and fertilizer applied in autumn and spring. The treated pasture was grazed by sheep in early spring and subsequently by bullocks

ryegrass are better able to recover from low doses than are annual and rough-stalked meadow grasses and stoloniferous types of *Agrostis* (creeping bent and brown-top). Yorkshire fog is intermediate in susceptibility. Rhizomatous grasses, e.g., couch (*Agropyron repens* and *Agrostis gigantea*) are resistant. Among the grasses of poorer hill land, *Nardus* is very susceptible and so probably is *Molinia* while it is green: the fine-leaved fescues show better recovery. Under hill conditions a change from *Nardus* or *Molinia* to fescue could be a considerable improvement.

For selective control of specific grasses, the dosage and season of spraying and the prior management of the sward would all have to be taken into account, and it is still too early to say whether differences in susceptibility are large enough for selective control in old pasture to be predictable or practicable. This is a field that will have to be investigated. (The same is true of dalapon, and will also apply to other grass-killers that are certain to appear in time.)

For the present, one of the most interesting features of paraquat is its selective action in the wider sense that clovers recover much better than grasses. In a number of trials on swards containing some clover, the death or suppression of grasses has been followed by a tremendous development of white clover. Rough-stalked meadow grass has been eliminated from lucerne, without damage to the latter, by paraquat applied at 4 oz a.i. per acre in early March.

Rejuvenation of leys

As a means of renovating leys, paraquat is thus very promising. Two characteristics of a run-down lay are: (a) reduced productivity of the clover, and (b) infestation of meadow grasses or creeping bent—grasses which are particularly susceptible to paraquat. Paraquat might also be used on a ley, even where no weed problem exists, in order to check the sown grasses temporarily and so rehabilitate the clover or lucerne. A relatively small dose of paraquat could be effective for these purposes.

A step in the right direction

Ploughing and reseeding is obviously not universally attractive. At the same time we must admit that our present methods of grassland improvement by surface treatment are painfully slow to show an economic return. If the better grasses, and clover, can be brought more quickly into a dominant position by the use of chemicals, there will be a greater incentive to give more of our old pastures the manurial treatment of which they stand in such sore need. In the short time of two years it has been shown that paraquat is a big stride in this direction. This experience is sure to act as a spur in the search for chemicals that will prove still more selective among our common grasses.

Meanwhile it is to be hoped that farmers will experiment freely with paraquat, over a wide range of conditions, to see what part it can play in pasture management as well as in reseeding. It has more interesting possibilities than can possibly be explored by a handful of research workers.

The authors of this article are both at the Grassland Research Institute, Hurley, Nr. Maidenhead. **J. O. Green, M.Sc.,** is head of the Department of Herbage Agronomy and **Lewis Jones, B.Sc.,** is a Senior Scientific Officer dealing with research on grassland improvements, with a special interest in herbicides.

W. M. R. Evans

describes an experiment comparing the performance of oat-reared and mash-reared Rhode Island Red pullets

Rearing Pullets on Oats

It is a popular belief amongst livestock farmers that the feeding policy adopted during rearing influences the productivity of animals. For some time poultry keepers have held a similar view.

Experimental work carried out in the 1950s showed that retarded growth during the rearing period tended to lead to an earlier onset of large eggs in the laying year. Retarded growth was achieved by either restricting the amount of food or by increasing the fibre content of the diet, in order to reduce the available energy and protein without reducing *ad lib.* feeding.

In 1955 we started a trial at Trawscoed Experimental Husbandry Farm to see if the feeding of whole oats on an *ad lib.* basis would get the same results as those obtained by feeding pullets during the rearing stage with a diet containing a high percentage of fibre.

On range and in batteries

In each of the three years 1955 to 1957, Rhode Island Red pullets at 8 weeks of age were divided at random into two groups. Each group was reared from this age to point-of-lay in separate paddocks of a highly productive ryegrass-white clover ley. During this period one group of pullets was fed whole white oats *ad lib.* The second group of pullets was fed balanced rearing pellets, also on an *ad lib.* basis.

During the rearing period the difference in the behaviour of the two groups of pullets was most marked. The oat-fed pullets spent a high proportion of the day ranging over the paddock, whilst the pullets fed on a balanced ration rarely moved from the vicinity of the rearing arks.

At the point-of-lay stage, 126 pullets were taken at random from each of the two groups and placed in laying batteries. During the period in the batteries all the pullets received a balanced layer's ration *ad lib.*

Only in 1957 were the pullets weighed before being placed in the battery. The oat-fed pullets weighed 4·7 lb and the pellet-fed pullets 5·7 lb. During the rearing stage the pellet-fed pullets consumed 4·75 oz per day, whilst the oat-fed birds ate 3·13 oz per day.

Each year the oat-fed pullets were markedly less mature than their counterparts at this stage.

In the laying batteries the pellet-fed pullets came into lay a month to six weeks earlier than those fed on oats. However, by the time these latter pullets had been in lay for four weeks they were out-yielding the pullets reared on balanced pellets. From this point to the end of the laying 'year', which lasted for 44 weeks, the daily output of eggs from the oat-fed pullets was consistently higher than that from the pellet-fed birds.

Throughout the laying 'year', for each of the three years, the average rate of production expressed as a percentage was 52·1 for the pullets reared on oats and 45·5 for the pullets reared on balanced pellets.

During 1957 the eggs were graded. As will be seen from the table below, the pullets reared on oats also tended to produce a higher percentage of large eggs.

Food during rearing period	Egg size			
	Large	Standard	Medium	Others
Oats	74·6	21·3	3·9	·2
Balanced pellets	72·1	22·3	5·1	·5

In view of the promising results obtained during the three years of this trial, it was decided to extend the trial to the Experimental Husbandry Farms at Great House (Lancs) and Gleadthorpe (Notts), for a further two years. Rhode Island Red pullets were used at each of the farms, with the exception of Great House; here White Leghorns × Rhode Island Reds were used in the first year. Standard rations were fed at each of the three farms.

Rearing results

The rearing results show that food costs of the oat-reared pullets were consistently below those fed on mash. From 8 to 20 weeks of age the average food costs for the three farms was 4*s.* 10½*d.* for the oat-reared pullets and 7*s.* 9½*d.* for the mash-reared pullets.

In both seasons at Gleadthorpe the weight of oats consumed exceeded the quantity of mash, whilst at the other two farms the weight of mash consumed exceeded that of the oats.

The weight gains at the 20-week stage were also consistent. Over the two-year period it was roughly of the order of the mash-fed pullets weighing approximately 1 lb, i.e., about 30 per cent heavier than the oat-fed pullets.

As a result of compensatory growth by the oat-fed pullets, there was little difference between the weights of birds from the two groups at the end of the laying year.

No consistent pattern was apparent in the incidence of mortality, although a higher death rate seemed to occur in the oat-fed pullets. This was probably due, in part, to the tendency of these pullets to range more widely and consequently fall prey more frequently to predators.

Egg production

The egg production level of the groups showed negligible difference, the average rate of production expressed as a percentage being 59·2 for the oat-fed pullets and 58·8 for the mash-fed birds. At Gleadthorpe the egg production rate of the mash-fed pullets was a little more than that of the oat-fed pullets; at the other two farms the reverse was the case.

The evidence supporting the claim that oat-fed pullets produce a greater total number of large eggs was not entirely conclusive. During the two-year period at the three farms, the oat-fed pullets produced more large eggs than did the mash-fed pullets on four occasions. On three of these they were also superior with regard to standard eggs. When the large and standard grade eggs were bulked, on four occasions out of six the proportion of eggs in these two grades laid by the oat-fed pullets exceeded those laid by the mash-fed birds. The differences in the percentage in favour of the oat-fed pullets amounted to 4·6, 7·9, 2·2 and 2·2. The differences in favour of the mash-fed pullets were 2·5 and 2·3.

Rather more conclusive was the evidence that oat-fed pullets produce a higher percentage of large eggs at the beginning of the laying cycle. This occurred on five out of six instances.

On each of the three farms the maturity rate of the oat-fed pullets was later than that of the mash-fed birds. The average difference was consistently about two weeks in favour of the latter pullets.

At Gleadthorpe and Great House, records of food consumed during the laying 'year' were kept. These records show that the oat-fed pullets ate at a slightly higher level than mash-fed counterparts to the extent of 0·05 oz per day.

Effects on profitability

Oat feeding invariably appears to lower the rearing costs to the point-of-lay stage by approximately three shillings. Part of this saving may, however, be offset by a higher juvenile mortality amongst the oat-fed birds.

The egg production levels of pullets reared on oats were also more frequently in excess of those pullets fed on mash. But this increased production of half a dozen eggs per bird may be offset by a delay of a fortnight in the oat-fed pullets reaching a 50 per cent lay.

Egg size too seems to be influenced favourably by rearing pullets on oats. Four times out of six birds reared by this method gave a greater proportion of large and standard weight eggs than pullets reared on balanced mash. Not only was the size of egg in the annual yield affected, but in five out of six instances there was a greater proportion of large and standard eggs laid in the early stages of the egg cycle by the oat-reared birds.

If rearing of pullets on oats is to be adopted as a means of improving profitability, account must be taken not only of the relative cost of foodstuffs but also of both the average egg prices and the likely trends in seasonal market prices for eggs of different weight.

This may be illustrated by the results at Great House. In 1958 the oat-reared pullets laid on average three more eggs than the mash-reared birds. Despite the fact that the oat-reared pullets, in addition, laid larger eggs at the start of the laying 'year', in total the mash-reared birds laid rather more than four standard and large eggs over the whole period. Sale of eggs and carcasses against the cost of day-old chicks and food during the rearing and laying periods gave a difference of 5¼*d.* in favour of the mash-reared pullets (25*s.* –1¼*d.* v. 25*s.* –6½*d.*). In 1959 the oat-reared pullets produced on average seven more eggs than the mash-reared birds and in addition both an initial and total number of large eggs. This resulted in an increased margin of 2*s.* 9*d.* in favour of the oat-reared pullets. The margin of sales over food and chick costs dropped from 14*s.* 9½*d.* for the oat-reared pullets and 12*s.* 0½*d.* for the birds reared on mash, due to a period of reduced egg prices. The relatively higher price for larger eggs favoured the oat-reared pullets and boosted the margin over the mash-reared birds.

The author of this article, **W. M. R. Evans, B.Sc.(Agric.), M.Sc.**, has been Director of the Ministry's Trawscoed Experimental Husbandry Farm, Aberystwyth, since it was set up in September, 1947.

FARM BUSINESS

Cows on a Card Index

An Advanced System of Recording and Budgeting

G. P. Chitty

THE amount of time which can be devoted to keeping records is limited on most farms, and so it is important to concentrate on keeping those of the most practical value. An over-elaborate system, which becomes a burden to keep and difficult to interpret, is not wanted. The type of records which should be kept will depend on the personal inclination of the farmer and the type of farming system.

Solving farming problems depends first of all upon an accurate diagnosis of the underlying causes, and in farm management work the starting point is an analysis of the farm's profit and loss account for the current year.

Most farmers are familiar with the technique whereby a number of efficiency checks are applied to the analysed accounts, with the object of highlighting any weaknesses in the farming system. This type of annual analysis, together with the preparation of budgets, is extremely useful in planning the overall farming policy and may be all that most farmers have the time or inclination to carry out. In addition, many dairy farmers have found it valuable to work out each month the quantity of food fed per gallon, the cost of the food and the financial margin left over after food costs are deducted from the price received for each gallon produced.

It can be argued that one disadvantage of these methods is that the facts and figures being dealt with are in a sense past history. A few progressive farmers here in Worcestershire, who have the necessary facilities for keeping records, have extended the system to include a forward annual budget and introduced monthly checks to see how the actual performance compares with the estimated position.

Example from Worcestershire

The purpose of this article is to describe a system of recording and budgeting which one farmer in the Evesham district has been using successfully to formulate and control a policy for his dairy herd for some years.

It should be pointed out that this is rather an advanced system which may not be applicable to many dairy farms at the moment, but if profit margins fall in the future more farmers may find it worth while to adopt some form of budgetary control.

The farm of 357 acres is mixed, with dairying as the main enterprise. It is run by the farmer and three full-time workers. In 1961, 109 acres of cereals were grown, and there was a flock of ninety-two breeding ewes and a herd of fifty Friesian cows.

Records for the dairy herd are kept on a card index—one card for each cow, giving details of identity, breeding, lactation yields, date of service and when she is due to calve. This information is summarized on the edge of each card which is kept in a folder so that all the breeding details of the cows in the herd can be seen at a glance. In addition, the card includes a graph of the milk yields of every lactation for each cow. These graphs are very useful as a basis for culling poor producers.

To know what the milk cheque for each month is likely to be, an annual budget of anticipated milk production is made; that is, the expected number of cows in milk and their production for each month in cash terms.

Illustration of the method (three months in 1961)

Budget of milk production, 1961

	Jan.	July	Dec.
Gal/cow/day			
4-yr average 1958–61	2·55	2·74	2·91
1961—Estimated	2·9	2·85	2·9
1961—Actual	3·02	3·0	3·08
Estimated cows in milk	37	37	41
Cows in milk (actual monthly average)	41	41	38
dry	10	10	10
Total	51	51	48
% in milk	80	80	79

continued on p. 124

continued	Jan.	July	Dec.
Gal/day			
Estimated	107	105	119
Actual	124	123	117
Gal estimated/month	3,317	3,260	3,690
Gal actual/month	3,843	3,821	3,638
Monthly prices—Estimated	3*s.* 4¼*d.*	2*s.* 3*d.*	3*s.* 3*d.*
Monthly prices—Actual	3*s.* 3⅜*d.*	2*s.* 5⅛*d.*	3*s.* 1⅜*d.*
Monthly estimated cheque	£556	£367	£598
Monthly actual cheque	£630	£463	£566

The starting point in constructing such a budget is to estimate the gallons of milk per cow per day on a monthly basis for twelve months ahead. Average figures for previous years and a knowledge of whether or not the general level of the herd is improving must be taken into consideration when arriving at this figure.

Reference is made to the breeding data of each cow and an estimate made of the average number of cows likely to be in milk for each of the twelve months. The January/March milk prices are usually available when the budget is worked out at the beginning of the year, but estimates of prices have to be made for the other months.

Having worked out this basic data, it is then possible to estimate what the monthly milk cheque is likely to be: in 1961, the actual annual sale of milk was £6,213 and the estimated production £5,831—an error of 6 per cent, mainly because the herd improved more quickly than was anticipated. The average number of cows in the herd in 1961 was 49 and the total gallons of milk sold was 44,391 gallons, giving an average per cow of 903 gallons. This was a satisfactory level of performance considering that one in four were cows with their first calf.

Performance picture

This budget is set out on a large sheet of graph paper. Besides this, details of food fed are recorded and a series of monthly efficiency checks is also included to give a complete picture of the performance of the dairy herd.

Record of food fed to the dairy herd

	Jan.	July		Dec.
Opening stocks (*cwt*)	1	11		7
Bought or home-mixed (*cwt*)	171½	81½		152
Total	172½	92½		159
Less closing stocks	1½	5½		6½
Total used (incl. steaming-up)	171	87		152½
Lb of food per gallon sold	5·0	2·55		4·7
Cost per ton	£27 10*s.*	£27 £25	bought own mix	£23 10*s.*
Cake—cost per month	£235	£114		£179
Estimate of grazing or silage costs	£108	£140		£165
Total Food Cost	£343	£254		£344

The feeding policy is to home-mix as cheap a ration as possible and to feed the cows generously in the winter, but as much milk as possible is obtained

from the grass in spring and summer. The concentrated food is issued to the parlour every day and recorded, and the actual mixture used during each month is calculated and related to the milk produced. Including steaming-up rations, an average of 4·9 lb purchased concentrates was fed in the six winter months and 2 lb of food fed per gallon of milk produced in the summer. In the last two winters the cows have had self-feed maize silage, and the milk yields have been maintained better than in previous years.

Other dairy efficiency checks

	Jan.	July	Dec.
Value of all foods fed per gal sold	21½*d.*	16*d.*	22⅝*d.*
Margin per gal over cost of all foods	17⅞*d.*	13½*d.*	14⅞*d.*
Margin per month over cost of all foods	£287	£209	£222
Margin per month over cost of concs.	£395	£349	£387
Margin per cow in herd over cost of concs.	£7·7	£6·9	£8·1
Margin per forage acre over cost of concs.	£8·4	£5·2	£7·9

Each month, the value of the food fed is calculated and the margin per gallon over food cost is worked out and compared with the previous year's performance. In 1961 the margin for the six winter months was 15·8*d.* per gallon and for the six summer months 15·5*d.* per gallon, so that although the aim is to obtain a level production throughout the year, there appeared to be a slightly higher margin in favour of winter milk.

And an eye on quality

Quality milk production is likely to be of considerable importance in the future. With this in view, monthly figures are entered at the bottom of the sheet for the butterfat and solids-not-fat, e.g., for the three months under consideration the figures were:

Jan.	July	Dec.
3·80	3·50	4.30
8·49	8·67	8·80
12·29	12·17	13·10

The advantages of this sort of system are that when the information is entered on a single sheet each month and the card index system is brought up to date, a complete and easily-seen record of the dairy enterprise is available. In addition, the monthly check enables the farmer to keep his finger on the pulse of the dairy enterprise and to take action if things are going wrong.

G. P. Chitty, B.Sc., is the N.A.A.S. District Advisory Officer for the Pershore and Evesham districts of Worcestershire. He is particularly interested in farm management work.

How great a pest to sheep farmers are carrion crows?

Light on this question is shed by ***Denis Burgess*** *following a three-year survey in the north*

Carrion Crows in Northern England

FARMERS in the north are familiar with attacks by carrion crows on sheep and poultry, but how much damage do they really do? Surveys were made in the winter and spring of 1960, 1961 and 1962 to try to obtain a better idea of the carrion crow's significance as an agricultural pest.

Direct observation would have given the fullest information, but a single incident takes up a lot of time; such a method is not feasible for a wide survey. Instead farmers were asked to notify Pests departments of damage and, if sheep or poultry were involved, carcasses were collected, where possible, and taken to the Veterinary Investigation Centres of the Northern Region for examination. Sometimes this was done personally by farmers and shepherds, and we are very grateful to them for this. Veterinary Officers were usually able to say whether an attack had been made before or after death, but it was sometimes impossible to decide whether an animal, attacked when alive, had been healthy or ill. This latter point is important, as attacks on dying animals are not of economic significance.

Surveys in five counties

In 1960, following some publicity, pests officers recorded damage throughout Northern England—Cumberland, Westmorland, Northumberland, Co. Durham and the North Riding. One-hundred and eighty-three attacks on sheep and four on poultry were noted. Unfortunately we had no means of ascertaining what percentage of the total number of attacks in the Region these surprisingly low figures represented.

It was decided, therefore, in 1961 to try to record all damage occurring at selected groups of farms in Cumberland, Westmorland, Co. Durham and the North Riding. In Northumberland recording of damage throughout the county was again attempted. Increased publicity was given to the survey in the selected areas.

In 1962 the survey was continued only in Cumberland and Westmorland the counties recording most incidents. As before, an attempt was made to

record all cases at selected groups of farms, mainly in hill areas—155 farms in Cumberland and 59 in Westmorland. It is thought that the majority of incidents occurring at these farms was recorded, while incidents reported at farms in other parts of Cumberland and Westmorland were also noted.

Carrion crows and sheep

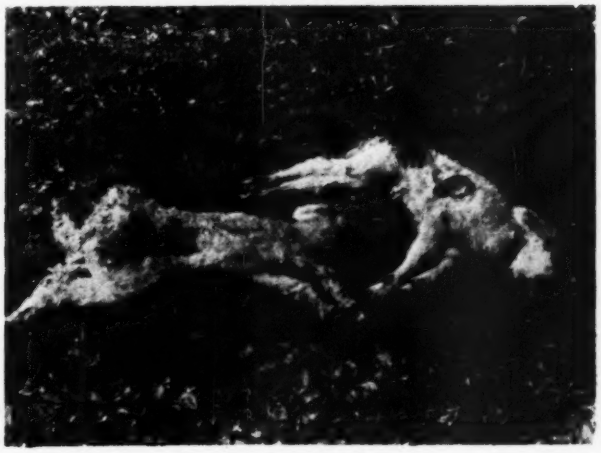
Carrion crows normally associate with sheep, particularly in winter and early spring. Supplementary food is available to crows in the form of sheep feed in winter, and placentae during the lambing season. In addition, there is always the possibility of a meal on the carcass of a ewe or lamb. Except at lambing time, sheep appear to display little antagonism towards crows, and even then a crow may sometimes be seen pecking at an after-birth while perching on the flank of a placid ewe.

Weather conditions influence the amount of damage caused by crows: the condition of the sheep and the feeding behaviour of the crows are both affected. The winters of 1959–60 and 1960–61 were mild and were followed by good lambing seasons; carrion crow damage was relatively light. The winter of 1961–62, however, was more severe, with several periods of snow and much frost, and this was followed by a long, cold spell in spring. Reports of damage came in swiftly but fell off suddenly when milder weather set in around 20th April.

The nature of the terrain also affects the extent of damage by influencing sheep management: incidents are reported more frequently in hill areas. However, in these areas the records of loss often vary widely from farm to farm, because of small differences in management. Where ewes are brought to in-bye fields near the farm, and given special attention before lambing, losses are less than where ewes lamb out on the hills. On many farms losses would be much higher if it were not for the vigilance of farmers and shepherds.

Attacks on ewes

During 1962 sixteen attacks on ewes were reported from the selected farms in Cumberland and Westmorland. This is a very low figure when it is considered that there are some 82,000 ewes on these farms. A total of 110 cases was recorded during the surveys.



New-born lambs—one with eye, tongue and navel pecked, the other with viscera pecked out through a hole in the side

A cage trap which has proved successful. The bag shows twenty-three carrion crows and two rooks

Almost all the cases reported related to attacks on live ewes, and nearly half involved fit ewes in snow-drifts, caught by the horn in a hedge, lying on the back, at parturition, or in some other temporary difficulty. Approximately a third of these ewes survived, the carrion crow attack having been seen or the ewe having been found soon after the attack. Of the sick ewes attacked, a high proportion were suffering from staggers, and some were being treated for this condition. It is probable that some of the sick ewes would have recovered but for the carrion crow attacks.

Attacks on live ewes occur mainly in the winter and spring. A few take place between lambing and shearing, however, particularly during wet periods, when the weight of the fleece prevents a ewe on her back from righting herself. From the end of June to the next winter incidents are rare. Early morning is the most frequent time for attacks, but they may occur at other times during daylight; there are fewest around midday.

Initial damage may be to one or both eyes, to the tongue, the navel, the anus, the flank or the back. There may be a combination of such injuries. The eyes are most commonly attacked, and survival is most frequently associated with this type of injury.

Attacks on lambs

Although attacks on lambs are some four times as frequent as those on ewes, the incidence is still low. Sixty-nine were reported during 1962 at the selected farms, which had a total crop of approximately 77,000 lambs. A total of 421 incidents was recorded during the surveys.

Half the cases concerned lambs attacked alive, and of these nearly half appeared to be fit lambs which would otherwise have thrived. In a very few cases, when the tip of the tongue had been pecked off, or when the flank had received a small wound, the lambs survived.

Attacks on live lambs occur at birth, particularly in difficult deliveries when the head only has been presented, and up to 2–3 days after birth. In a few incidents older lambs, up to 2–3 weeks old, were involved, but usually these were sick or already dead at the time of the attack. Attacks on live lambs are more likely in the case of twins and triplets, but incidents at the time of birth are more frequent in cases involving single lambs. It has been

suggested that difficulties of birth and of mothering may make an attack more likely on lambs born to ewes lambing for the first time. There was no indication of this in these surveys.

As with ewes, damage may be to the eyes, tongue, navel, anus, flank or back, but other head, neck or chest injuries sometimes occur. Again, attack is most likely to occur in the early morning.

Other damage

During the surveys attention was concentrated upon sheep damage, as being most significant; other types of damage were not recorded so fully.

Carrion crows visit calving fields to feed on after-birth, but no attacks on calves were recorded. One attack on a cow was noted: a flank wound was pecked on successive days, but whether the wound had been made by crows in the first place was not determined.

Five cases involving poultry were recorded. In one instance eggs had been taken, and in others chicks and pullets, up to three months old, had been killed. The decrease in number of free-range birds has reduced the significance of the crow as a predator of poultry.

One mink farmer reported the destruction of litters by female mink, which had become agitated when carrion crows perched on the tops of the cages to peck at fish and meat offal placed there as food for the mink.

Although it is known that carrion crows, in association with other corvids, damage crops and consume grain and animal foodstuffs during severe winter weather, no instances of this were recorded during the surveys. Presumably rooks and jackdaws receive the entire blame for such damage, since they are usually present in much larger numbers than carrion crows.

Attacks on eggs and the young of game-birds and other birds were not investigated, since these are not of direct agricultural importance.

Control measures

The principal method of controlling carrion crows is by organized shoots at winter roosts, but other methods have been examined.

Cage trapping was investigated during the three winters, 1960–62. Large cage traps, with ground and top entrances, provided with adequate fresh bait, and preferably with a decoy bird, have given good results. In the most successful trap, 221 carrion crows were caught between 1st October, 1961, and 31st March, 1962. Cage traps are best sited on the leeward side of winter roosts and within a few hundred yards of them. They should not be placed in woods or very close to them, and the sites should be open with good all-round visibility. Locations where interference by fox, badger and man is unlikely, are preferable.

Some observations have been made on the effectiveness of nest destruction, the use of stupefying bait, and decoy shooting. This work is being continued.

The surveys have given an indication of the extent of agricultural damage caused by carrion crows in Northern England, but much more knowledge of carrion crow biology is needed before very effective control can be achieved.

The author of this article, **Denis Burgess, B.Sc.,** has been the Ministry's Regional Pests Officer in the Northern Region since 1958. During the last three years he has made a particular study of carrion crows, their control and the damage caused by them.

Is lamb shearing only a tradition? Many opinions but few facts were available on this subject. A N.A.A.S. investigation has found out more about it

Should Lambs be Shorn?

asks **L. BAILEY JONES**

In various parts of Britain lamb shearing has for many years been accepted as an integral part of good sheep husbandry. To leave lambs unshorn would be unthinkable. But is it really worth while?

To get a reasoned answer, rather than mere opinion, it was decided four years ago to investigate the economics of lamb shearing in Kent. Although this work was confined to one county, the results could very well apply elsewhere.

Progressive farmers are constantly on the look-out for new developments and ideas, and in the mechanical field these are many and varied. But it is not always so easy to apply new ideas in the livestock world. It may well be that some livestock work on our farms, hitherto accepted as standard practice, has become unnecessary in the light of present-day knowledge.

Those in favour

Hitherto one of the strongest arguments in favour of shearing lambs was to prevent sheep blowfly strike, but with the development of modern dips and fly-deterrent sprays this pest is no longer a serious menace.

Another reason in favour of shearing is in the case of away-wintered lambs. These lambs are often agisted on farms situated at fairly long distances from the home farm and are not under the continuous surveillance of the owner. Unshorn lambs are more prone to becoming entangled in bushes than shorn ones, and in some away-wintered lambs fairly heavy losses can result when shepherding is lax. Also if scouring occurs in away-wintered lambs, soiled and dirty wool on the hindquarters is more likely in unshorn lambs.

In areas where lamb shearing is traditional practice, it is claimed that lambs offered at store sheep sales realize rather more money if shorn. This may be true; but it is probably due to prejudice and local custom rather than sound fact, and no good reason has been given why this is so. Neither is any sound evidence advanced to support the claim that lambs do better after shearing.

Wool merchants are in favour of shearing. They say that there is a demand for a certain amount of lamb wool, and that if this demand is not met by home production, then lamb wool will be imported. Assuming this to be true, and if it is desirable to keep this market at home, then presumably the price paid for it will continue to be such as to make lamb shearing sufficiently remunerative.

Three-year Kent trial

Kent, and particularly Romney Marsh, is one of the areas where lambs are shorn regularly—very often before the main flock. It was in Kent, therefore, that this three-year trial was set up. Five farms were selected, involving 230 lambs. Most were pure Kents, but there were a few Kent crosses.

At each farm the lambs were weighed, earmarked, and divided by live weight into two equal groups on 18th June, 1958. One group was shorn in the lamb year and the other group not shorn. The weight of lamb wool was recorded and both groups on each farm were run together and given similar feeding and management. Further weighings were made on 22nd September, 1958, 15th April, 1959, and 5th June, 1959, when both groups (now tegs) were shorn and wool weights recorded.

This method was repeated in 1959-60 on three of the original farms, with 210 lambs. The weighing dates were 11th June, 1959, 18th September, 1959, 1st April, 1960, and 16th June, 1960. In 1960-61 we took two of the original farms with 88 lambs; weighing dates were 22nd June, 1960, 15th September, 1960, 18th April, 1961, and 8th June, 1961.

Taking an average of the three years and covering a total of 528 lambs in the trial, we have the following results:

			Advantage	
	Unshorn *lb*	Shorn *lb*	Unshorn *lb*	Shorn *lb*
Liveweight gain	73·2	74·2	—	1·0
Lamb wool	—	1·76	—	1·76
Teg wool	8·99	8·0	0·99	—

The liveweight variations were insignificant; in one year the unshorn group had a slight gain, whilst the shorn group had the advantage in the other two years.

As was expected, teg wool from the unshorn group was greater but total wool was greater from the shorn group. However, on the basis of 1962 wool prices, the financial return from wool for the three-year average figure would be:

	£ *s.* *d.*
Shorn group	2 1 8 per head
Unshorn group	1 19 4 per head

If the cost of shearing is taken into consideration there is little, if any, financial advantage.

The results of our trial indicate that there are no disadvantages attached to shearing lambs. Liveweight and financial differences are insignificant, provided the balance of price between lamb wool and teg wool remains as at present. The advantages appear to be the fulfilment of a demand for lamb wool and the avoidance of some of the troubles attendant on away-wintered lambs.

'To shear or not to shear' is therefore a question which each flockowner must decide for himself in the light of his own particular circumstances.

The author of this article, **Mr. L. Bailey Jones,** is the N.A.A.S. Livestock Husbandry Officer in Kent. He holds a university diploma in Agriculture and, prior to his present appointment, was Livestock Husbandry Officer for seventeen years in Montgomeryshire.

The Ministry's Publications

Since the list published in the February, 1963, issue of *Agriculture* (p. 86) the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops (addresses on p. 150), from Divisional Offices of the Ministry or through any bookseller at the price quoted.

BULLETINS

No. 95. Strawberries (Revised) 5*s.* (by post 5*s.* 5*d.*)
The essentials of successful production and cultivation are dealt with in this revised edition. There are sections on varieties, manuring, cultivation, propagation, harvesting and marketing, and pests and diseases.

LEAFLETS

Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Government Buildings, Block C, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 6d.)

ADVISORY LEAFLETS

No. 160. Swift Moths (Revised)
No. 279. Skin Spot and Silver Scurf of Potatoes (Revised)

OTHER PUBLICATIONS

Experimental Horticulture No. 8 (New) 7*s.* (by post 7*s.* 6*d.*)
This number covers a wide range of subjects, from tomato growing under glass to gooseberries, strawberries, and several flower crops.

Farm Incomes in England and Wales, 1960 (New) 7*s.* 6*d.* (by post 8*s.*)

When agricultural land which has been mined for coal, iron or gravel is returned to the farmer, how should he recapture its fertility?

● **The first of a series of three articles**

Bringing Back the Acres

Opencast Coal

W. Morley Davies

SURFACE mining for minerals has long been practised in the English countryside. Before the coming of power-driven machinery, it was mainly carried out by pick and shovel. In the early days it was confined to the winning of superficial materials such as road metal, iron ore, limestone, gravel, sand, clay and a few others. The growing needs of the community in this industrial age have seen a vast extension of opencast mining. In the old days little lasting damage was done to the surface, since the workings were to a great extent in the hands of the owners, who cared for their property and who, wherever possible, ensured that it was returned to a productive state. But with increasing demands and more powerful machinery, deeper and deeper holes were made into the earth. And not only that. The affected areas increased. An awakening of public feeling and responsibility now demands that wherever possible these vast holes shall not be allowed to remain as permanent scars on the countryside. With only few exceptions, the extractive industries seem to be aware of the need for restoring the land so that it will again become productive. Many of them in fact are ensuring that this is done.

Looking to the future, with the world's ever-increasing population, demands for food will increase. In our own small island, where good land will become increasingly valuable, we cannot afford to let a single acre go derelict.

Principles of restoration

Whether the workings are for coal, ironstone, sand and gravel, or for other minerals, the principles underlying the restoration of the land to a condition suitable for cropping are largely common to them all. If the land

lies in a highly productive agricultural area, then it may well be quite expensive to restore it to a condition which in time will be fully productive and in which a farmer can use it with the hope of making a good living. If the area is in the mountains, then the expenditure on restoration can obviously be far less. To grow paying crops the land must be fertile and under conditions of good husbandry continue to be so over an appreciable number of years.

On recently restored land the standard of management must be high, especially for the first few years of cropping. Restored land, however well managed, is never as fertile during the first few years as in its undisturbed state. This is particularly noticeable when the soil and subsoil are heavy.

Broadly, the soil factors concerned with fertility are those affecting its chemical, physical and biological status.

Chemical factors

The chemical factors are the supplies of plant nutrients and the soil's organic content. The nutrients are those which any agriculturist must consider in the ordinary way of farming—nitrogen, phosphates and potash. The required levels of these three nutrients on restored land are higher than on normal land and, as a rough guide, should be doubled during the first few years. Those nutrients needed in small quantities—the trace elements—are seldom important, and advice should be sought before they are applied. Nitrogen is the element in greatest need, followed in a number of cases by phosphates. Potash should only be applied in normal quantities. Lime may be needed, but to make sure the soil should always be tested.

The paramount need for organic matter in the surface demands that the original soil, properly conserved for the purpose, should always be put back. In a few cases, where little or no top soil may exist, a build-up of surface organic matter can be achieved only over a considerable period. Provided the restoration of the soil has been properly carried out, the farmer will have the control of nutrients largely in his own hands.

Physical factors

The physical factors, however, are much less under his control. These are just as essential for successful cropping as the nutrient supplies. The surface soil must be free-working and porous; if it is sandy these conditions are ensured by the very nature of the surface material, but if it contains appreciable quantities of clay, then this must be aggregated in the form of small granules or crumbs. In a heavy soil the alternative to a crumbly surface is one of stickiness and impermeability, both of which conditions are useless to the crop. The formation of crumbs on the surface is greatly helped by the presence of plenty of organic matter.

It will be obvious therefore that careful preservation of the top soil, treated in such a manner that, as far as possible, its original crumb structure is not destroyed, is essential. Any sticky, weathered material coming from deeper down in the profile must not contaminate the surface, otherwise difficulties of cultivation will certainly ensue.

The free movement of air and water is equally important in the subsoil, at least as far as the point to which the roots penetrate. Under natural conditions, the structure found in the heavier subsoils has taken years to develop and unfortunately this is almost inevitably destroyed during restoration. No one knows how long it will take to reappear, maybe hundreds of

years. The most that can be done in the restored subsoil is to ensure that pans or hard layers resulting from the passage of heavy machines are broken up by deep cultivation. If this is not done the roots and air will not penetrate and the water will be held near the surface. It is an unfortunate fact that the farmer has far less control over the physical character of the soil than he has of its nutrient status.

Biological factors

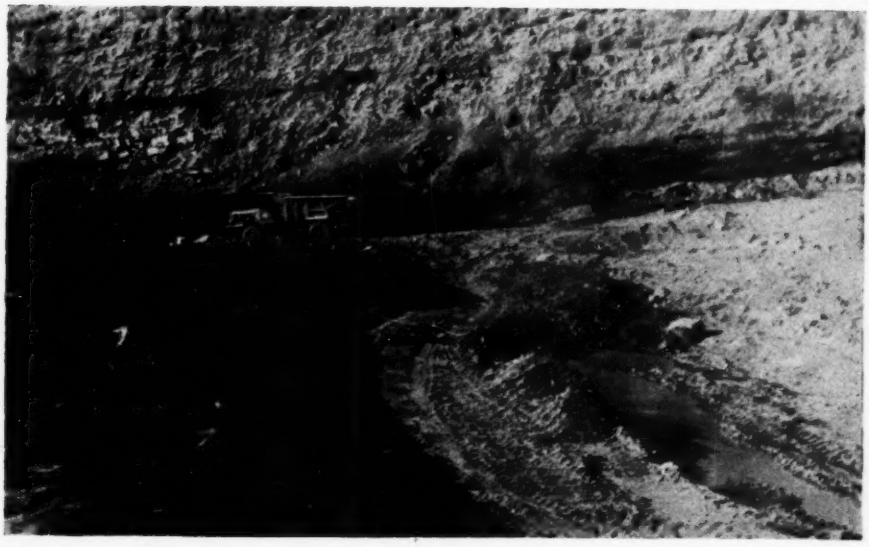
Although important, the biological conditions are not nearly so well understood as those just described. Broadly, they consist of the activities of myriads of organisms living mainly in the surface soil. How far these organisms contribute to fertility has not yet been very clearly defined. Some of them are closely connected with the breakdown of organic substances, others live on simpler materials derived from the more complex. It is well known that a number of these organisms are essential to fertility. Some, such as those responsible for fixing nitrogen, are necessary to the growth of legumes, others are essential for different processes.

There is therefore an overwhelming case for replacing the top soil, since it is the seat of much of the soil's activity.

After opencast coal working

No doubt man has worked surface coals from the earliest times, but it is only since 1941 that opencast working has been carried on as a matter of national policy. From that time it has been a Governmental decision that the agricultural land shall be restored to a condition which allows cropping to proceed. To achieve this, top soil has always been segregated and replaced. This practice has always seemed to be a matter of common sense, particularly on the heavier Coal Measures soils which were not easy to cultivate in any case. Since those days we have learned a great deal more from experience.

Opencast coal working in Warwickshire



It was soon discovered that adequate drainage systems must be installed, otherwise the restored soils became waterlogged after heavy rain. If tough lower layers, formed by the passage of heavy machinery exist, they must be broken up. Restoration in wet periods must be avoided, since it leads to unnecessary consolidation. It soon became apparent that the subsoil (i.e., below the top 12 inches of soil and extending down for 2 feet) must always be removed separately, stored and replaced, so that the soil lies on material free from boulders, rocks, shale and blue clay, etc.

All this experience has been embodied in the 1951 Code which, from that time, has been the standard laid down for all to follow. It may fairly be said that if this Code is faithfully followed the standard of restoration is as good as can be obtained.

But even under the best conditions of restoration it became clear that the disturbance of the soil profile led to many difficulties and to an undoubted reduction in fertility. To overcome some of these early difficulties, it has become the accepted rule to hand over the land to the Ministry of Agriculture so that it could have a five-year course of remedial treatment. The building up of fertility at this early stage following physical restoration is much more important than attempting to make a profit. The guiding principle has therefore been to get the soil back into a reasonably fertile state before returning it to the farmer.

Five-year course of treatment

It can be assumed in all cases where a drainage system is necessary that a suitable installation will be made.

The first crop is almost invariably grass. The land is limed where necessary at the rate of 2–3 tons per acre. The field is often subsoiled by means of deep rooting machines or a modified mole plough. This is particularly important where vertical water movement is sluggish or where a pan exists. The usual agricultural cultivations are necessary. Disturbance of the soil by ploughing several times during the first year or two is an advantage. Since the natural crumb structure is not directly attainable, this early cultivation helps to produce an artificial granularity. Consolidation and puddling of the top soil must be avoided at all costs, and this applies equally during the initial period as well as after the land has been returned to the farmer.

As already said, restored land needs a high standard of management and much more fertilizer than would normally be used must be given. The grass seeding rate must be high.

Most of what has already been said will apply equally to the land after the land has been released to the owners and occupiers. Emphasis must still be put on building up the desirable soil structure, but it can be expected that the land will begin to produce at a profit.

In many cases the land will be put down in long-term leys or permanent grass. Only in the drier climates, or where local custom indicates, will mixed cropping be practised.

Grass to build crumb structure

The grass sward, more than any other form of cropping, is invaluable for building up a crumb structure. The stronger the sward and the more prolific the rooting system, the better for the land. Many kinds of seed mixtures

Restored farmland in Warwickshire. The fencing re-establishes the line of a former hedge

have been tried and experience shows that one of the following are to be recommended:

Permanent Mixtures	*lb per acre*		
	A	*B*	*C*
Italian ryegrass (S.22)	2	—	—
Perennial ryegrass (S.23)	5	—	—
Perennial ryegrass (S.24)	5	—	—
Cocksfoot (S.143)	8	3	—
Timothy (S.48)	4	6	—
Smooth-stalked meadow grass	1	—	1
Late-flowering red clover (S.123)	2	2	4
White clover (S.100)	1	1½	2
Kent wild white clover	½	½	—
Tall fescue (S.170)	—	6	—
Meadow fescue (S.53)	—	6	—
Alsike	—	1	4
Chicory	—	—	1
Cocksfoot (S.143) or Timothy (S.48) or Meadow fescue (S.53)	—	—	6

For poor upland grazing, a cheaper type of mixture can be used. If the farmer has any difficulty over what kind of mixture to grow his District Advisory Officer will help him.

Caution in the early years

Although it seems beneficial to move the soil by cultivation two or three times in the early years, a different outlook must be adopted later. The development of a crumb structure starts at the surface and gradually extends downwards. In a few years' time this will have reached several inches and must be looked upon as an indicator of return to fertility and therefore a valuable asset. It should not be broken up by ploughing under, otherwise the process must start all over again. In practice this means that the sward should be maintained for as long as possible in a fertile condition. Only when it begins to fail should renovation by surface cultivation take place.

Generous manuring is essential and should be carried out every year. The young pasture should never be trodden by cattle in periods of wet weather.

In wetter districts the farmer is often in the dilemma of needing grazing for his cattle when his better judgment would tell him to keep them off the land. Under the circumstances it is a great advantage to have available some undisturbed land where the animals can be turned for a time. If the soil is slow in building up its crumb structure, it is better to take a crop of hay than to practise continuous grazing. Four cwt per acre of a suitable complete fertilizer should be applied annually. Of the nutrients required, nitrogen is the most necessary and a further 2 cwt per acre of a nitrogenous fertilizer, such as sulphate of ammonia, can be given midseason. If a high output of grass is required still more fertilizer may be necessary. Phosphates in excess of the amount at present in the compound may be necessary on certain soils, and 10 cwt per acre of basic slag applied at two- or three-yearly intervals will be advisable. Potash is not greatly in demand, except when the grassland is to be utilized very intensively. Farmyard manure is valuable if it can be spared.

Arable cropping

Success in arable farming on restored sites depends very much on the climate. An arable rotation which is possible in the West Riding may never succeed under the wetter conditions of Lancashire. Again, the standard of husbandry must be high and the level of fertilizers applied adequate. In arable districts a rotation embracing cereals interspersed with grass has proved the most useful. Roots, including potatoes, have not been very satisfactory. Of the cereals, wheat is more reliable than barley or oats.

For the cereals, the manuring must be generous. Autumn wheat should receive 4 cwt per acre of complete fertilizer or its equivalent in straights. A spring dressing up to 4 cwt per acre of a nitrogenous fertilizer is necessary if good yields are to be obtained.

Since the land at this stage is rather low in fertility, the older varieties of wheat may be preferable. Should the farmer wish to grow a modern higher-yielding variety, such as Cappelle, he must be prepared to increase the nitrogen dressing even up to the level of 6 cwt per acre of Nitro-Chalk or its equivalent. On the whole, spring-sown wheat is not satisfactory, owing mainly to the difficulty of carrying out the necessary cultivations at that time of the year.

Oats will yield satisfactorily in the dry climates but, like other cereal crops, it must have adequate supplies of fertilizers. Winter-sown oats should have a manuring of 3 cwt per acre of complete fertilizer at sowing time, followed by a lighter nitrogenous top dressing in spring.

Barley can often be grown satisfactorily and is probably the best of the cereal crops for spring sowing. It requires the same basal dressing as recommended for other cereals, followed later by 2 cwt per acre of a nitrogenous top dressing.

Summarizing, amongst the most important points to observe are: keep the drains running freely; use good seed mixtures; avoid poaching the land in wet weather; use plenty of fertilizers, and whenever in doubt seek advice through the local District Advisory Officer.

Until he retired in 1959 the author of this article, **W. Morley Davies, M.A., B.Sc., F.R.I.C.,** was a senior Advisory Officer in the N.A.A.S. and was Chairman of the Ministry's Land Restoration Committee.

2. Mid-Bedfordshire

A. Brown

IN THE early nineteenth century Thomas Batchelor, a Bedfordshire farmer, said that 'the north of Bedfordshire is remarkable for cold wet clays and late harvests' and also that 'the gardeners of Sandy and Girtford have been long celebrated for the excellence of their culinary vegetables'. Since then the area of vegetable growing has been extended considerably ; it now occupies about 24 per cent of the 65,000 acres which make up this district.

Mid-Bedfordshire is bounded in the north by the River Ouse and extends southwards almost to the chalk escarpment of the Barton Hills. In the east it borders the counties of Cambridge and Hertfordshire and runs westwards to Ampthill.

A geological map of the district resembles a patchwork quilt with one outstanding feature, the Lower Greensand ridge. This runs south-eastwards across the district from Ampthill, where it rises to 390 feet, to Potton in the north-east. The area contains extensive woodlands, the most attractive scenery of the district, and Shuttleworth Agricultural College. On its fringe, at Silsoe, is Wrest Park, the home of the N.I.A.E., and the site of the new National College of Agricultural Engineering. On either side of the greensand lie the younger soils formed from the gault and glacial boulder clay, whilst in the north are the oldest soils formed from the Oxford Clay. At Tempsford in this area a battle was fought in 917, when Edward I finally crushed the Danes. Here also has been developed one of the most modern glasshouse flower nurseries in this country.

Cutting through the centre of the district and across the Greensand ridge is the River Ivel, which flows north to join the Ouse. The River Flit runs eastwards to join the Ivel in the south of the district and in its valley, near the village of Clophill, are large deposits of Fuller's earth which are dug during the summer months. The valley of the Ivel is composed of glacial and gravel soils and, together with the Lower Greensand ridge, forms the area well known for its market garden produce. It is estimated that the gross value of vegetables sold from the district is slightly more than £2 million per year. Good rail and road communications with centres of population are invaluable for market gardeners and this area is well served by both. The Great North Road and the main railway line from London to the north run through the Ivel valley and on the western side of the district is the A6 London-Carlisle road and the railway line connecting London to the Midlands.

The soils on the Lower Greensand and valley gravels have been enriched in the past by London stable manure, originally brought by horse-drawn carts and later by railway. Today most of the vegetables are transported by

road and the growers who purchase farmyard manure do so locally. Large quantities of soot and shoddy are used on both the light and heavier soils. Many market gardeners have firm faith in soot for ameliorating soil conditions and improving their Brussels sprouts. Bags of soot can frequently be seen standing in fields awaiting spreading, commonly by hand or occasionally by mechanical manure spreader.

The acreage of vegetables has changed over the years. Onions have declined from 1,406 acres in 1912 to less than 100 today. Brussels sprouts, on the other hand, have doubled over the same period to about 7,000 acres. About another 7,500 acres are devoted to other vegetables, chiefly cabbages, runner beans, beetroot, lettuce, parsnips, marrows and parsley.

About 2,000 acres of early potatoes are grown annually, the main varieties being Ulster Chieftain, Ulster Premier and Arran Pilot. Lifting begins about mid-June, a little later than the early districts of Cornwall and Pembroke.

Wheat and barley are extensively grown on the gault and glacial boulder clay soils to the east and south of the Greensand ridge. Malting samples of barley are produced by some fortunate farmers and hence Proctor is the most popular variety. Of the winter wheats, Cappelle still remains the firm favourite. Brussels sprouts, maincrop potatoes, sugar beet and short-term leys are the most common break crops in the rotation. The only sizeable orchards are in the parish of Cockayne Hatley, where some 500 acres of intensively grown apple trees produce high quality Cox's Orange Pippin.

To the west of the Greensand ridge is an area of glacial boulder clay and Oxford Clay. This land is generally more undulating than on the eastern clay soils and mixed farms with dairy or fattening cattle and some sheep, though not numerous, are more common. Out of a total of 1,195 holdings in Mid-Bedfordshire, 78 per cent are under 50 acres. The majority are fragmented market garden holdings, which create their own special problems. The first Land Settlement Association was created at Potton in 1934 as a result of a gift of some 300 acres by the late Sir Malcolm Stewart to pioneer the rehabilitation of industrial unemployed men.

The district has an average rainfall of about 23 in., so it is not surprising that arable is preferred to livestock farming. In fact, animal and animal products account for only about 16 per cent of the gross output. Pigs account for just over one-third of the total gross output from livestock and P.I.D.A. has a progeny testing station at Stotfold in the south-east corner of the district. Dairy herds are slowly declining in numbers and contribute only about one-quarter of the gross output for animal or animal products.

The farmers on the lighter land in particular are well aware of the benefits of irrigating potatoes and vegetables. They appreciate the need to store winter water to augment the meagre summer rainfall and reservoirs are becoming a more familiar sight on farms.

Farmers have taken advantage of the F.I.S. and many new barns and buildings to house grain drying and storage equipment have been erected. The Horticultural Improvement Scheme has also attracted a steady flow of inquiries.

With such a wealth of market gardening experience, it is not surprising that the standard of farming is very high. The district has other advantages. Cooke, writing in 1810, said 'the air of this county is mild and salubrious. The face of the country is agreeably diversified by hill and dale and the scenery much enlivened by the steeples of churches'.

L. M. PARSONS
Agricultural Land Service, Nottingham

Building Layout and Labour

FARMERS are reinvesting more and more of their profits in buildings and equipment to serve future needs, so it is salutary to reflect that over two-thirds of all paid farm work is carried on in and around farm buildings. If savings can be achieved by better layout, there will not only be a rise in productivity but, equally important, an increase in returns to the farmer himself.

During the past decade an enormous amount of capital and thought has been expended on special grain drying and storage outfits so that corn can be handled easily and swiftly by one or two men. Similarly, fertilizer and potato handling and storage have been the subject of innumerable investigations and inventions. But much too low a priority has been given to design and layout of new buildings on the ordinary farm, where livestock form part and parcel of the business.

Since the most profitable livestock enterprises are nearly always housed in farm buildings, every saving the buildings can show will add to the expected returns. But because we must house livestock to get the best possible output, we have to use straw, cart foodstuffs and haul dung. Unnecessary handling of these bulky and heavy materials will lead to serious losses of efficiency and tired-out farm workers. So all buildings should be designed to avoid waste of labour. Labour requirements in any livestock enterprise depend almost entirely on the ease with which buildings can be used. We cannot afford to house livestock merely to produce dung, so unless it pays to house them, we should not house them at all. But as stock certainly does better inside and uses food more efficiently, any building should be properly designed and sited in the first place.

Labour, or machinery which replaces labour, accounts for such a high proportion of the costs of farming operations and so much of this labour is used about the farmstead, that it is time we paid more attention to layout. Ground should never have to be covered twice without results, and no step should be taken unnecessarily. We are undoubtedly losing at the farm buildings much of the efficiency we have gained in the fields over the past twenty years.

Again, studies of farmstead layout have frequently emphasized the use of expensive mechanical equipment to overcome poor arrangement of buildings and yards. Good layout has no operating costs, and a little thought given to new buildings before they are put up will be well repaid by increased efficiency and less hard work. But simplicity of layout is often complicated by other factors. Many buildings and most equipment are now sold ready-made by the manufacturers. So the eventual solution is really a mixture of com-

promises and mistakes, because the individual building required has to be fitted to the job and cannot be tailor-made. This almost always means a less satisfactory use of labour.

Inefficiencies in labour use due to modification of horse-and-cart methods to suit a tractor can easily be spotted. But nothing like enough is known about the integration of buildings, equipment and production methods. It is even harder to comprehend the effects of internal planning and external arrangements of buildings combined with an assembly of diverse methods and equipment.

If entirely new farmsteads could be built, designed with the help of work study principles, much could be done to solve the difficult problems of layout. But a farmer very rarely acquires a full complement of fixed equipment at one time. Bits and pieces are usually added as the enterprises change or develop or as new equipment becomes available. This inevitably means compromise and complications and even more difficulty in discovering common errors.

One of the greatest obstacles to real improvement is the apparent reluctance to pull down old buildings. Because the familiar old barn, with all its homely hazards, has become part of the landscape, it often assumes a permanent nuisance value. Although many old scars bear witness to past alterations, it is very difficult to suggest that it is a drag on productivity and should be replaced by a modern structure designed for the job.

The needless fatigue which results from badly contrived routines evolved to fit badly designed buildings or inconvenient monuments to Victorian ingenuity has serious effects on men paid to do farmyard jobs. Fatigue means lack of time and energy to attend properly to such jobs as food rationing, extra care with sick animals or young stock and attention to detail with machines or equipment. More especially, men will have insufficient inclination or opportunity to do the real jobs they are paid for. Working conditions substantially affect productivity and we must be prepared to spend much more money on improving them without expecting immediately noticeable effects on returns. It is always worth while having a second look at the old familiar routines; to check up on the jobs your buildings make you do; or to re-examine the way you have to farm because of the buildings you have.

A clean sweep could easily result in savings of as much as one man/year of labour. Instead of two men being fully employed throughout the winter on routine livestock work, only one may be required; or, better still, more stock could be kept for the same labour expense. Instead of three men looking after a dairy herd of 45 cows, one man could look after 60. Or, by application of farm management techniques, revised or entirely new enterprises could be undertaken without having to employ more men.

Of course, such a clean sweep can very rarely be made—and on most farms it is not even necessary. What is necessary is the ability to look at the farmstead with a fresh and critical eye to question all the jobs that go on around the buildings. And, finally, not to succumb to the temptation to buy expensive new equipment merely to overcome flaws in design and layout of the buildings that could have been avoided by proper planning.

A lot of our buildings have outlived their usefulness; most of the rest only require some thought and study to be completely satisfactory; a few are modern structures perpetuating bad old outmoded routines. A careful and recurring consideration of all of them will help us farm successfully in the sixties and seventies.

Agricultural Chemicals Approval Scheme

Additions to the 1963 List

INSECTICIDES

DISULFOTON

A systemic organo-phosphorus insecticide for the control of aphids on sugar beet, potatoes, Brussels sprouts, cabbages and cauliflowers.

Granular Formulations

Disyston—Baywood Chemicals Ltd.

PHORATE

A systemic organo-phosphorus insecticide for the control of aphids on sugar beet and potatoes.

Granular Formulations

Thimet Phorate 10% Granules—Cyanamid of Great Britain Ltd.

FUNGICIDES

SULPHUR—*Colloidal and Wettable Formulations*

Baywood Wettable Sulphur—Baywood Chemicals Ltd.

HERBICIDES

2,4-D

Formulations of the acid specifically for the selective control of weeds on farm roadside verges, hedge banks and around farm buildings.

Formulations in Oil

Vergemaster—Baywood Chemicals Ltd.

DICHLORPROP WITH 2,4-D

A mixture of translocated herbicides for post-emergence use in cereals to control a range of broad-leaved annual and perennial weeds.

Amine Formulations

Marks Polytox-M—A. H. Marks & Co. Ltd.

DICHLORPROP WITH MCPA

A mixture of translocated herbicides for post-emergence use in cereals to control a range of broad-leaved annual and perennial weeds.

Potassium and Sodium Salt Formulations

Seritox—May & Baker Ltd.

DINOSEB—*Amine Salt Formulations*

Dinoseb Amine M & B—May & Baker Ltd.

MALEIC HYDRAZIDE

A herbicide for retarding the growth of grass on farm roadside verges.

Liquid Formulations

Regulox—Baywood Chemicals Ltd.

MECOPROP WITH 2,4-D

For the control of white clover, plantains, daisy, starweed, creeping buttercup, dandelion and other weeds in cultivated turf.

Liquid Formulations

New Verdone—Plant Protection Ltd.

PROPHAM—*Wettable Powders*

Profarma Propham Wettable Powder—Profarma Ltd.

SEED DRESSINGS

THIRAM SEED DRESSINGS

Fernasan 75s Plant Protection Ltd.
(slurry)

Amendment to 1963 List of Approved Products

SEED DRESSINGS SECTION: Amend (*a*) of Limitations entry on page 90 to: dressings containing *gamma*-BHC on carrot seed if crop is intended for canning.

IN BRIEF

Swine Fever: New Slaughter Policy

With the aim of stamping out swine fever from Great Britain, the compulsory slaughter (with compensation) of affected pigs and those which have been exposed to infection, began on 11th March, 1963. After that date infected herds will be slaughtered and the carcasses destroyed. The stock will be valued by agreement or by a professional valuer. The owner will be able to dispute the valuation if he wishes, and in this event the matter may be referred to arbitration.

Compensation will be paid by the Ministry of Agriculture, Fisheries and Food, at full value for all pigs slaughtered which show no evidence of swine fever, and at half the 'healthy' value for those which are affected with swine fever at the time of slaughter. No compensation will be paid for any consequential losses, but the Ministry will normally bear the cost of cleansing and disinfecting the premises. Re-stocking will be permitted 14 days after disinfection has been completed.

Swine fever is one of the most serious diseases that affects pigs. Caused by a virus, it is contagious and attacks pigs of any age, breed or sex, the interval between infection and the appearance of symptoms being anything between 3 and 28 days. In severe attacks the death rate may be very high.

The presence of the disease should be suspected—and must be immediately reported to the police—when several pigs die or are sick or unthrifty. Symptoms of diarrhoea, husky cough, or loss of condition, particularly in pigs recently brought on to the premises, should arouse immediate suspicion of swine fever.

To reduce the incidence of swine fever, 'Infected Area' restrictions, which control the movement of swine into, out of and within an area, will be imposed where necessary. But if the disease is to be eradicated from this country every pig owner must play his part. Swine fever can never occur unless the virus has been introduced in some way. Replacement stock should be isolated from the main herd for 28 days after their arrival, a watch being kept for signs of ill-health. Pigs must not have access to swill that has not been boiled continuously for at least one hour. It is only with the full co-operation of all pig owners that swine fever can be stamped out in this country.

Money down the Drain

Dry rot in a farmhouse which we heard about recently is costing £1,800 in repair bills. In spite of its name, dry rot requires moisture before it can attack timber. In this case the attack had been caused by neglecting to keep gutters and downpipes clear and drains running.

But dry rot is not the only trouble which can be caused by faulty gutters and downpipes. Foundations may sink due to excessive wetness under unguttered eaves. Mortar between bricks crumbles away as water streams down walls. Barn stanchions rust. Blocked drains turn yards into quagmires to the detriment of the feet of the cattle and the temper of the men.

From small beginnings the defects build up until major work and large sums of money are needed to put matters right. A regular annual inspection of gutters and drains is very worth while.

The amount of refuse that gets into gutters is amazing, including leaves and birds' nests. And when you are clearing these out, don't forget the hidden valley gutters. Check, too, that they are not cracked or broken, that the joints are waterproof, supporting brackets are firm, and whether they need another coat of paint.

Now have a look at the downpipes. Are they properly fitted to the gutters, firmly attached to the walls with proper distance pieces to allow painting all round? Are there enough of them? (There should be one for each 40 ft of gutter and one sq. inch of downpipe to each 100 sq. ft of roof area.) Do they have open shoe ends and discharge into gullies? Are they likely to be damaged by passing traffic? If so, fit some form of guard.

Having now reached ground level it is easy to clear off any rubbish from gully grids and check them for breakages; see also that they are surrounded by a serviceable kerb. Remove the grids and dig out any solid sludge from the trap of the gully.

Next open each inspection chamber and check that pipes are clear, rodding where necessary, and that brickwork, rendering and covers of chambers are undamaged.

Finally, check that the outfall is clear, whether into a catchpit, ditch or pond.

Fowl Pest: Vaccination of Laying Birds

Some commercial egg producers are afraid that birds vaccinated against fowl pest while still in lay will drop in egg production. The subsidized vaccine being issued by the Ministry is an inactivated or dead vaccine and of itself has no harmful effects. Rough handling, on the other hand, can interfere with egg production.

Ample supplies of subsidized fowl pest vaccine are now available throughout England and Wales, and all poultry-keepers are strongly advised to protect their birds as soon as possible. The present policy of slaughtering flocks infested with fowl pest stops on 31st March, and unless by then the vast majority of birds are immunized, there could be a serious spread of disease as infected flocks remain alive to form centres of infection.

The poultry-keeper who does not vaccinate his birds not only runs the risk of serious losses if his own birds go down with fowl pest, but his unprotected flock is a danger to neighbouring poultry-keepers.

Poultry-keepers who need vaccine should get in touch with their Ministry Divisional Executive Officer or Animal Health Office.

Irrigation has a Future

At the National Association of Agricultural Contractors' Conference last month, Mr. W. Emrys Jones, Director of the N.A.A.S., spoke of the increasing importance which irrigation will play in the future. At the moment 130,000 acres are irrigated in England and Wales, and the area is increasing at the rate of 15,000 acres a year. We know more nowadays of the way in which crops respond to irrigation, their precise timing and the effect on yield, flavour and quality of individual crops.

In commercial horticulture irrigation has become a vital necessity; profitable production is almost impossible without it. In an economic survey (by E. B. Fekete) of a sample of thirty-two Vale of Evesham holdings it was found that the average profit margin of holdings with irrigation facilities was more than six times as high as on other holdings. Production on irrigated holdings was two-and-a-half times that on unirrigated holdings.

On the basis of the annual water requirements of various crops and the financial benefits received from irrigation, it can be said that fruit, vegetables, potatoes and peas can justify irrigation, even with water at 4*s*. per 1,000 gallons; sugar beet and

field beans, only when water is available at low cost; grass, only when water is at low cost and where there is a sufficiently intensive livestock enterprise to utilize the extra growth efficiently; and spring cereals, only where 'free' water is available and equipment has been provided for other purposes.

Thus a rough guide to the order of priority of crops would be: vegetables, fruit, potatoes, grass (if intensively used), sugar beet, field beans, cereals.

Potatoes in particular respond well to irrigation: for example, in experimental work at Woburn, earlies have given a 50 per cent increase and ware 80 per cent.

Colorado Beetle in 1962

Colorado beetles have not been known to breed in the United Kingdom since 1952, but each year some are found and reported to the Ministry. They are sometimes discovered on ships and in motor cars or aircraft, but the most important way in which they enter the country is on leafy vegetables and new potatoes. Such beetles may be detected by the Ministry's inspectors during routine work at ports, but more often they are found and reported to the police or the Ministry by housewives, shopkeepers and other members of the public.

By drawing attention to especially dangerous produce and localities, these discoveries assist the Ministry in making regulations designed to reduce the risk of importing Colorado beetle. This was well illustrated in 1962, when a large number of beetles were found on Italian potatoes exported from Campagnia, an area not previously known to be heavily infested. On one occasion, 20 live beetles were found in a truck being unloaded at London. Before unloading had been finished, the truck was sealed and returned to the Continent and might possibly have contained even more beetles. Of the 20 beetles, one was still in the grub stage, indicating that the potatoes had been harvested in an infested field.

One infested ship-load had to be fumigated before release, and altogether 45 live beetles, including three grubs, were discovered on Italian potatoes. In addition, 12 dead beetles, including one grub, were found on Italian consignments under circumstances suggesting that, but for accidental or deliberate crushing, they would probably have been alive on entering the country.

Apart from the Italian beetles, the number found in 1962 (*6*) was much smaller than the total for 1960 (*46*) or 1961 (*23*). One arrived on Spanish greengages, one on Belgian potatoes, and one with potatoes and vegetables from the Mediterranean region. Two were on shipments from France—one in bulk wheat and the other with a cargo of brandy and dried milk. The remaining single live beetle was found on a barge plying between the London Docks.

The Ministry is grateful to everyone who reported the presence of Colorado beetles, and hopes for the continued help and vigilance of the public in the campaign against this pest.

H. W. Janson

Ministry's Publications: Change of Address

The Section dealing with the distribution of the Ministry's publications will be moving from Ruskin Avenue, Kew, on 22nd March to Government Buildings, Block C, Tolcarne Drive, Pinner, Middlesex.

All applications for leaflets and inquiries about publications should henceforth be made to that address.

Books

Elements of Agriculture (14th edition). W. FREAM. John Murray. 30*s*.

Nurtured as I was on a very early edition of Fream's *Elements of Agriculture*, to review the new (fourteenth) edition is an exciting adventure. What a record of agricultural history and development the sequence of 'Fream's' supplies!

The new edition has been brought up to date and enlarged with new chapters on animal breeding and farm organization. The revision has been ably executed, but quite clearly limitations of space have restricted the authors. For instance, the chapter on animal breeding is no more than an introduction to the subject and the untutored would have difficulty in grasping its substance. Concepts are introduced and, whilst the meaning of certain terms can be gleaned in passing, they are neither defined nor explained simply.

Problems inherent in animal breeding are discussed and compared with the much simpler problems facing the plant breeder. The importance of environment in determining phenotype is stressed, methods of selection outlined and various breeding plans mentioned.

Shortage of space is again apparent in the chapter on organization and management which, nevertheless, is extremely competently written, although a greater degree of selection in the topics discussed would have been advisable. As it stands at the moment, the chapter is inadequate for the needs of students and inquiring farmers.

In a comprehensive text-book of this type, where the mass of material to be included is immense and always increasing, one is bound to find omissions. I was disappointed to find no reference to the output of grassland and methods of grassland recording, both of fundamental importance. Nor was there reference to such problems as bracken and heather control which, by sheer acreage, surely merit mention.

The task of editing a volume like this is far from simple but the easy-flowing continuity of style is marked throughout, which reflects great credit on the editor. The R.A.S.E. is to be congratulated on continuing its task of keeping this standard work up to date. It is very apparent, however, that the cross-roads have now been reached, and when the time arrives for a new edition the R.A.S.E. will have to consider its policy boldly and with vision.

If 'Fream' is to remain a standard text-book that one can recommend to agricultural students and to the keen inquiring farmer, it is very evident that the policy of restricting space and thereby omitting vital information must be overcome. To extend 'Fream' beyond its present size would mean a most unwieldy volume, and it seems clear that it should be a two- or three-volume work.

'Fream' is part of agricultural history and life, and to keep pace with the times it will have to take on a new look and be replanned, as indeed the whole of the industry is being reorganized to meet the needs of the times. The present volume can be recommended with confidence to all students of agriculture; but the needs of the future are great and to meet those needs, fearless planning and bold adventuring in a new edition are absolutely essential.

H.I.M.

Electricity Supply to the Countryside. Electrical Development Association.

Electric light, heat and power have become so much a part of the everyday life of the nation that few people ever give a thought to where it all comes from—until the supply fails, or the subject hits the headlines. Then the ins and outs of the matter seem so technical that only people with special knowledge can understand them.

For country-dwellers interested in knowing more about how electricity is brought to them, this 20-page booklet is now available free on application. It is well illustrated with photos, diagrams and graphs, and at the back is a coloured chart showing all the people who may have to be consulted when the erection of a new overhead line is being planned.

Also included is something farmers ask for from time to time, i.e., an authoritative statement on the relative merits of a single-phase compared with a three-phase supply. The conclusion to be drawn from this, incidentally, is that in the long run a single-phase supply is adequate and less costly for farms having no exceptional need for heat or power.

It is pointed out that the matter should be looked at as a whole and not allowed

to be bedevilled by the fact that, size for size, single-phase motors are more expensive in first cost than three-phase ones.

Nothing is said about the financial assistance that may be available to farmers who are thinking of installing or extending an electricity supply. But that aspect is fully dealt with in another booklet (also published by E.D.A.) entitled *Financial Assistance for the Development of Electricity on Farms in Great Britain and Northern Ireland.* This includes three main sections on Grants and Subsidies, Long-term Loans, and Income Tax Relief and Allowances.

Both booklets can be obtained free from the Electrical Development Association, 2 Savoy Hill, London, W.C.2.

N.K.G.

About Biology. KARL VON FRISCH. Oliver and Boyd. 25*s.*

For the general reader this book should prove a useful introduction to many aspects of biology. In language that could hardly be made more simple, it ranges widely over such items as the nature of cells and tissues, the functions of the organs of the human body, embryology, heredity and evolution.

There are sections on amoebae and other unicellular organisms; on snails, birds, insects and—as one would expect from von Frisch—on the life of the bee.

The work has been well-translated and has many merits as a present for any young person who wishes to read something of the science of living things outside the pedestrian school text-books. It is mercifully free from erudite expositions of minute detail. The author has been ruthless in tearing away the barbed-wire entanglements of technical jargon which often seem inseparable from the teaching of science.

The result is a book that is a pleasure to read—not least for the author's views on the possibilities of improvement in the fields of ethics and human responsibility.

There must, however, be many professional biologists (not to mention botanists) who will raise their eyebrows at Professor von Frisch's almost cavalier treatment of the plant kingdom. In comparison with the length of the book, there is very little of the structure and life of green plants, while the references to fungi and bacteria (although well done) are all too few. Nor does there seem to be sufficient space given to the basic similarities between plants and animals. But to mention this is only to say that the book is not perfect, and what book is?

The veteran von Frisch would have done an excellent job had he done no more than demonstrate to teachers that it is possible to explain the essential facts of science clearly and simply, without references to flashy technicalities, and yet without concession to inaccuracy.

J.G.

Agriculture in Britain (2nd Edition). H.M. Stationery Office. 3*s.* 6*d.*

For an industry which employs a mere 4 per cent of the total working force of Britain, we have lately heard a lot about agriculture. And rightly so, for few other home industries can match its record. In the space of thirty years it has advanced from the dog-and-stick farming of the depression years to a stage where it now produces about half of all the food we consume. The way in which this has been achieved, and the effect on the use of land, production, livestock numbers and farm incomes and costs, forms the subject matter of the first half of this useful pamphlet.

The second part comprises a brief but remarkably complete account of Government policies over these years, especially since 1947. In that year the Agriculture Act proclaimed its objective of a stable and efficient industry, capable of producing such part of the nation's needs as is desirable in the national interest. The methods of implementing that objective—the annual review, the production and other grants, and the less spectacular but no less valuable measures such as the legislation on land drainage, land tenure and labour—are clearly explained.

Finally, there are sections on marketing, control of diseases and pests, advisory services, research and education. An appendix provides some useful addresses of agricultural organizations, and a short reading list which, although rather weighted towards official publications, nevertheless records all the farming classics.

Agriculture in Britain is one of a series of pamphlets put out primarily for overseas information, but it must have an equally important role to play at home. There must be many who, not being active in the industry, are mystified by the difficulties over agriculture manifest in the Common Market negotiations. They surely will welcome this clear, concise, yet comprehensive guide to British farming.

L.W.T.

The Daffodil and Tulip Year Book, 1963. Royal Horticultural Society. 12*s.* 6*d.*

'The mixture as before' might sound derogatory, but it is, in fact, a notable achievement to produce a collection of articles as well-balanced and interesting as those in the previous twenty-seven issues of the Daffodil Year Book.

While the daffodil as a show flower remains the leading interest, the compilers are to be congratulated on their choice of authoritative contributors and avoidance of trivialities, so making this book a desirable addition to all daffodil growers' bookshelves.

The survey of double daffodils, past and present, contributed by Matthew Zandbergen, is both valuable and interesting; so also is the account of recent research work in Holland on hot-water treatment—work which deserves study by all growers, amateur and commercial. Willis White describes the scope of present-day commercial production in Lincolnshire, where mechanization has led to a bulb area of 7,000 acres, a quite astonishing development within three generations of bulb-growers.

For other reasons, too, the 1960s are likely to be turning-point years for daffodil growers. This year book records the death of two of the outstanding daffodil breeders of this century: Lionel Richardson and Guy Wilson. Younger contributors give evidence that new ideas are springing from the old foundations, and two interesting trends are indications of newer colour preferences and closer links with U.S.A., New Zealand and Australia.

The popularity of miniatures continues, both as garden and cold-house plants and for floral arrangements, all these topics being covered by experienced writers. A breeder of miniatures, Cyril Coleman, who has become world famous for his *cyclamineus* hybrids, is honoured by this volume being dedicated to him.

Once again the Year Book is admirably illustrated, both in monochrome and colour, the quality of the latter now being excellent.

K.H.J.

Pig Husbandry. JOHN LUSCOMBE. Farming Press (Books) Ltd. 28*s.*

There are several recent books on the subject of pig production and, to be welcome, any new one is expected to contain either fresh information or ideas, or both. On that score this book does not disappoint for, in addition to an up-to-date view of the breeding, feeding and management of pigs, there are some straightforward, thought-provoking comments on most facets of pig production. It also contains a good deal of information for the student and provides a most valuable preparation for anyone entering the business of pig production. It is of slightly less value to the established and successful pig breeder, who may be justified in holding rather different opinions and adopting different practices, although he might be well advised to match his own experiences and views with those of John Luscombe.

There are slight inconsistencies which may puzzle the reader. For example, one paragraph has the heading 'Lesser breeds should be kept' and later we find 'Too many strains of pigs'. There is much repetition. Twice we are impressed by the prices at one time realized by Landrace; twice we are given the formula (not quite the same in each case) for a dressing against mange; twice we are informed that some factories kill pigs the day after they are received and told of the effect of this on killing-out percentages—and so on. There were occasions, in fact, when the impression was gained that parts of the book had been read before. Certainly the reader is left with the feeling that a major problem of pig husbandry is mange.

These points, however, are of minor consequence in relation to the wealth of knowledge and sense which the book contains, particularly in the consideration of factors influencing profitability, comments on housing, feeding and feedingstuffs, and systems of management.

J.D.I.

The Haughley Experiment, 1938-62. The SOIL ASSOCIATION. 5*s.*

What goes on in the soil? Twenty-five years ago a group of private people, who felt that we might be paying too much attention to chemistry in our farming and too little to biology, began research on a farm scale in Suffolk to try to find out what effect, if any, different methods of management had upon the soil. They thought it might provide useful information on the relationship between the quality of food and ways of growing it. They argued that if such a relationship existed, it would probably be reflected in terms of health.

So they divided the farm into three sections. On one, called 'the Organic section', no fertilizers or sprays are used.

It depends for its fertility upon F.Y.M., rough-composted with green weeds, and ley mixtures including deep-rooting weeds. A second section, the 'Mixed', was farmed in the conventional way, with F.Y.M. conventional leys, and chemical fertilizers and sprays applied according to local practice. The third section is 'Stockless', farmed without livestock, but with liberal applications of fertilizers and all organic matter derived from straw, stubble, etc., ploughed back.

Thus was born the Haughley Experiment, the only such experiment on a field scale in the whole world. It did not set out to prove anything: only to try to learn what happens when you do or don't do certain things. It has now issued its first report.

It must be emphasized that this experiment can refer to only one farm in one part of England, so too much generalization would be rash. But the results are startling.

Contrary to common belief, the section to which no artificials have been applied shows no loss of fertility; in fact, fields at Haughley which have received no chemical manures for upwards of thirty years seem to be gaining in fertility, and this is reflected in the yields. On the other hand, yields in general on the Organic section have been slightly less than on the Mixed, and the leys appear less luxuriant.

But there is a small herd of Guernseys on each of these two sections, as nearly as possible identical, served by a common bull and managed in the same way. Each lives on the produce of its own section. One of the most consistent results has been that the 'Organic' cows have yielded better than the 'Mixed' cows and their total solids are slightly higher (12·5 per cent compared with 12·1 per cent). Moreover, the 'Organic' herd has the better breeding record and eats less bulk of food. It looks as if the lower yields of the Organic section could be more nourishing than the greater bulk of the other. Extended experiments on these lines are now contemplated.

The data and experience arising from Haughley after a quarter of a century's continuous observation are invaluable, providing material that is available nowhere else.

The Report is available (5*s.* 9*d.* including postage) from The Soil Association, 8F Hyde Park Mansions, Marylebone Road, London, N.W.1.

L.E.

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Printed in England under the authority of Her Majesty's Stationery Office
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